636589

REPORT NUMBER 301L-GTL-03-006

SAFETY COMPLIANCE TESTING FOR FMVSS NO. 301L FUEL SYSTEM INTEGRITY

TOYOTA MOTOR CORPORATION
2003 TOYOTA HIGHLANDER, MPV
NHTSA NO. C35103

GENERAL TESTING LABORATORIES, INC.
1623 LEEDSTOWN ROAD
COLONIAL BEACH, VIRGINIA 22443

JUNE 26, 2003

FINAL REPORT

PREPARED FOR

U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
[redacted]ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
400 SEVENTH STREET, SW
ROOM 6111 (NVS-220)
WASHINGTON, D.C. 20590

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Approval Date: 06/26/03

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted By: [signature]

Acceptance Date: 7/7/03

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
301L-GTL-03-006	N/A	N/A

4. Title and Subtitle	5. Report Date
Final Report of FMVSS 301L Compliance Testing of 2003 TOYOTA HIGHLANDER, MPV NHTSA No. C35103	June 26, 2003
	6. Performing Organ. Code GTL

7. Author(s)	8. Performing Organ. Rep#
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9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)
General Testing Laboratories, Inc. 1623 Leedstown Road Colonial Beach, Va 22443	N/A
	11. Contract or Grant No. DTNH22-01-C-11025

12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
U.S. Department of Transportation National Highway Traffic Safety Admin. [redacted] Enforcement Office of Vehicle Safety Compliance (NVS-220) 400 7th Street, S.W., Room 6111 Washington, DC 20590	Final Test Report June 04, 2003
	14. Sponsoring Agency Code NVS-221

15. Supplementary Notes

16. Abstract

Compliance tests were conducted on the subject, 2003 Toyota Highlander MPV in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-301-02 for the determination of FMVSS 301 compliance.
Test failures identified were as follows:
NONE

17. Key Words	18. Distribution Statement
Compliance Testing Safety Engineering FMVSS 301	Copies of this report are available from NHTSA NHTSA Technical Reference Div., Rm. 5108 (NPO-230) 400 7th St., S.W. Washington, DC 20590 Telephone No. (202) 366-4946

19. Security Classif. (of this report)	21. No. of Pages	22. Price
UNCLASSIFIED	66	

20. Security Classif. (of this page)
UNCLASSIFIED

Form DOT F 1700.7 (8-72)

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SECTION 1

PURPOSE OF COMPLIANCE TEST

1.0 PURPOSE OF COMPLIANCE TEST

A 2003 Toyota Highlander MPV was subjected to Federal Motor Vehicle Safety Standard (FMVSS) No. 301 testing to determine if the vehicle was in compliance with the requirements of the standard. The purpose of this standard is to reduce deaths and injuries occurring from fires that result from fuel spillage during and after motor vehicle crashes, and resulting from ingestion of fuels during siphoning.

1.1 The test vehicle was a 2003 Toyota Highlander MPV. Nomenclature applicable to the test vehicle are:

A. Vehicle Identification Number: JTEGD21A530058515

B. NHTSA No.: C35103

C. Manufacturer: TOYOTA MOTOR CORPORATION

D. Manufacture Date: 01/03

1.2 TEST DATE

The test vehicle was subjected to FMVSS No. 301 testing on June 04, 2003.

SECTION 2

COMPLIANCE TEST RESULTS SUMMARY

2.0 TEST RESULTS

All tests were conducted in accordance with NHTSA, Office of Vehicle Safety Compliance (OVSC) Laboratory Procedure, TP-301-02 dated 8 November 1994 and General Testing Laboratories, Inc. (GTL) Test Procedure, TP-301-02, "Fuel System Integrity".

Based on the test performed, the 2003 Toyota Highlander MPV appears to meet the lateral impact requirements of FMVSS 301 testing.

SECTION 3

COMPLIANCE TEST DATA

3.0 TEST RESULTS

The following data sheets document the results of testing on the 2003 Toyota Highlander.

SUMMARY OF RESULTS

Vehicle's NHTSA No.: C35103 Test Model: HIGHLANDER

Test Date.: 06/04/03 Time: 16:16 Temperature 64 ° F

Vehicle Model Year, Make, Model and Body Style:
2003 TOYOTA HIGHLANDER MPV

Vehicle Test Weight: 3970 lbs.; Impact Velocity: 19.4 mph

Type of Front Occupant Restraint System Installed in Test Vehicle:

Driver's DSP: TYPE 2 BELT WITH FRONTAL AIR BAG IN STEERING WHEEL AND SRS AIR BAG IN OUTBOARD SIDE OF SEAT BACK.

Right Passenger's DSP: TYPE 2 BELT WITH FRONTAL AIR BAG IN DASH AND SRS AIR BAG IN OUTBOARD SIDE OF SEAT BACK

Stoddard solvent spillage from Vehicle's Fuel System: None

REMARKS: THE DRIVER SIDE SRS AIR BAG IN SEAT BACK DEPLOYED.

RECORDED BY: _____ DATE: 06/04/03

APPROVED BY: _____

DATA SHEET 1
TEST VEHICLE SPECIFICATIONS

TEST VEHICLE INFORMATION:

NHTSA No.: C35103
Year/Make/Model/Body Style:2003 TOYOTA HIGHLANDER MPV
Engine Data: 2.4 LITER INLINE
Transmission Data: 3 SPEED AUTOMATIC PLUS OVERDRIVE
Final Drive Data: FRONT WHEEL DRIVE
Major Options: ALLOY WHEELS, QUICK ORDER PACKAGE
Date Received: 03/12/03 ; Odometer Reading: 107 miles

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured By: TOYOTA MOTOR CORPORATION
Date of Manufacture: 01/03
VIN: JTEGD21A530058515

GVWR: 2260 kg (4985 lbs.);GAWR Front: 1300 kg(2865 lbs.)GAWR Rear: 1240 kg (2735 lbs.)

DATA FROM VEHICLE'S TIRE PLACARD:

Location of Placard on Vehicle: DRIVER'S "B" PILLAR
Tire Pressure With Maximum Capacity Vehicle Load —
Front: 30 psi; Rear: 30 psi
Recommended Tire Size: P225/70R16
Recommended Cold Tire Pressure:Front = 210 kPa(30 psi) Rear = 210 kPa (30 psi)
Size of Tires on Test Vehicle: P225/70R16
Type of Spare Tire: FULL SIZE

Vehicle Capacity Data —

Type of Front Seat(s): BUCKET
Number of Occupants: Front = 2 ; Mid = ___ Rear = 3 ; Total = 5

A. VEHICLE CAPACITY WEIGHT (VCW) =	925	lbs.
B. Number of Occupants x 150 lbs. =	750	lbs.
RATED CARGO AND LUGGAGE WEIGHT (RCLW) = A - B =	175	lbs.

RECORDED BY: _____ DATE: 06/04/03
APPROVED BY: _____

DATA SHEET 2
PRE-TEST DATA

WEIGHT OF TEST VEHICLE:

A. As Received At Laboratory (Maximum Fluids) —

Right Front = 449.9 kg (992 lbs.) Right Rear = 334.3 kg (737 lbs.)

Left Front = 454.9 kg (1003 lbs.) Left Rear = 341.5 kg (753 lbs.)

TOTAL FRONT = 904.9 kg (1995 lbs.) TOTAL REAR = 675.8 kg (1490 lbs.)

% of TOTAL = 57 % % of TOTAL = 43 %

TOTAL DELIVERED WEIGHT = 1580.8 kg (3485 lbs.)

B. Calculation of Target Test Weight —

1. Total Delivered Weight = 1580.8 kg (3485 lbs.)

2. Rated Cargo & Lugg. Weight (RCLW) = 79.4 kg (175 lbs.)

3. Weight of 2 Dummies (164 lbs. each) = 148.8 kg (328 lbs.)

TARGET TEST WEIGHT = 1 + 2 + 3 = 1808.9 kg (3988 lbs.)

C. Vehicle, Dummies and 79.40 kg (175 lbs.) of Cargo Weight —

Right Front = 493.0 kg (1087 lbs) Right Rear = 407.3 kg (898 lbs)

Left Front = 487.1 kg (1074 lbs) Left Rear = 413.2 kg (911 lbs)

TOTAL FRONT = 980.2 kg (2161 lbs) TOTAL REAR = 820.5 kg (1809 lbs)

% of TOTAL = 54 % % of TOTAL = 46 %

TOTAL TEST WEIGHT = 1800.7 kg (3970 lbs)

Weight of Ballast secured in cargo area = 95.25 kg (210 lbs)
Type of Ballast: SALT BAGS
Method of Securing Ballast: REAR SEAT BELTS
Vehicle Components Removed for Weight Reduction:
NONE

DATA SHEET 2
PRE-TEST DATA CONTINUED

TEST VEHICLE ATTITUDE:

As Delivered —	Right Front:	800	mm (31.5 inches)
	Left Front:	800	mm (31.5 inches)
	Right Rear:	820	mm (32.3 inches)
	Left Rear:	815	mm (32.1 inches)
As Tested —	Right Front:	788	mm (31.0 inches)
	Left Front:	790	mm (31.1 inches)
	Right Rear:	788	mm (31.0 inches)
	Left Rear:	794	mm (31.2 inches)

Vehicle's Wheelbase = 2715 mm (106.9 inches)

FUEL SYSTEM DATA:

Fuel System Capacity Listed in Owner's Manual = 75.0 liters (19.8 gallons)
Usable Capacity Figure Furnished By COTR = 75.0 liters (19.8 gallons)

Test Volume Range (91 to 94% of Usable Capacity) — 92.5%

68.1 liters (18.0 gallons) TO 70.4 liters (18.6 gallons)

ACTUAL TEST VOLUME = 69.3 liters (18.3 gallons) (with entire fuel system filled)

Test Fluid Type: Stoddard solvent
Test Fluid Specific Gravity: .7583
Test Fluid Kinematic Viscosity: 1.7 centistokes at 77° F
Test Fluid Color: BLUE ("red" is preferred)
Type of Vehicle Fuel Pump: ELECTRIC
Electric Fuel Pump Operation with Ignition Switch ON and Engine OFF —
NO

Details of Fuel System: HIGH PRESSURE ELECTRIC FUEL PUMP SUPPLYING FUEL INJECTORS WITH LOW PRESSURE RETURN LINE TO FUEL TANK.

REMARKS:

RECORDED BY: _____ DATE: 06/04/03
APPROVED BY: _____

DATA SHEET 3
POST IMPACT DATA

TYPE OF TEST: 301L
TEST DATE: 06/04/03 ; TIME: 16:16 ; TEMP.: 64 °F
VEH. NHTSA NO.: C35103 ; VIN: JTEGD21A530058515

REQUIRED IMPACT VELOCITY RANGE: 18.9 to 19.9 mph

ACTUAL IMPACT VELOCITY: (speed traps located within 5 feet of impact plane)

Trap No. 1 = 19.4 mph Trap No. 2 = 19.4 mph
Average Impact Speed = 19.4 mph

REMARKS:

RECORDED BY: _____ DATE: 06/04/03
APPROVED BY: _____

DATA SHEET 4
SUMMARY OF FMVSS 301 DATA

TEST VEHICLE NHTSA NO.: C35103 ; TEST DATE: 06/04/03

VEHICLE YEAR/MAKE/MODEL/BODY STYLE:
2003 TOYOTA HIGHLANDER

TYPE OF IMPACT: 301L

STODDARD SOLVENT SPILLAGE MEASUREMENT:

A. From impact until vehicle motion ceases —

Actual = 0 oz. Maximum Allowable = 1 ounce

B. For 5 minute period after vehicle motion ceases —

Actual = 0 oz. Maximum Allowable = 5 ounces

C. For next 25 minutes —

Actual = 0 oz. Maximum Allowable = 1 oz./minute

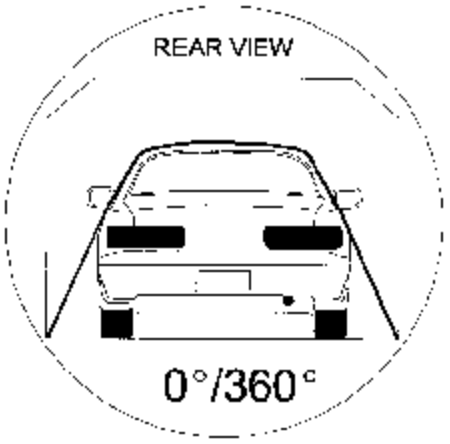
D. Provide Spillage Details: NONE

REMARKS:

RECORDED BY: _____ DATE: 06/04/03
APPROVED BY: _____

DATA SHEET 5
STATIC ROLLOVER TEST DATA:

A. Test Phase = 0° to 90°



Determination of Stoddard Solvent Collection Time Period:

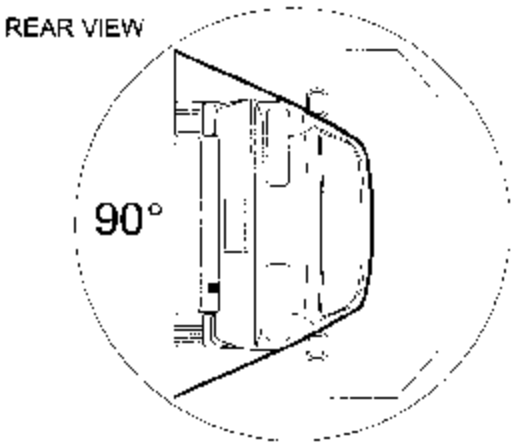
1. Rollover Fixture 90° Rotation Time = 1 minutes, 35 seconds

(Specified Range is 1 to 3 minutes)

2. FMVSS 301 Position Hold Time = 5 minutes, 0 seconds

3. TOTAL = 6 minutes, 35 seconds

4. NEXT WHOLE MINUTE INTERVAL = 7 minutes



Actual Test Vehicle Stoddard Solvent Spillage:

1. First 5 minutes from onset of rotation = 0 oz.
(5 oz. allowed)

2. 6th minute = 0 oz.
(1 oz. allowed)

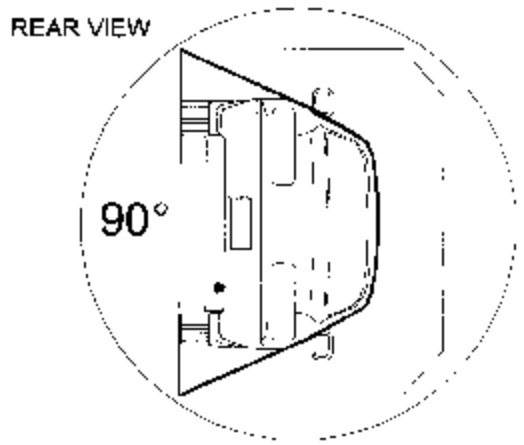
3. 7th minute = 0 oz.
(1 oz. allowed)

4. 8th minute (if required) = N/A oz. (1 oz. allowed)

Provide Details of Stoddard Solvent Spillage Locations — NONE

DATA SHEET 5 CONTINUED

B. Test Phase = 90° to 180°



Determination of Stoddard Solvent Collection Time Period:

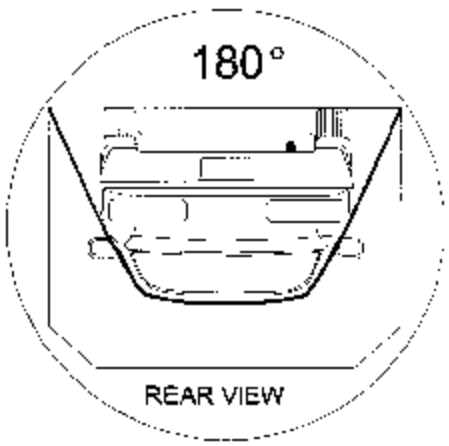
1. Rollover Fixture 90° Rotation Time = 1 minutes, 34 seconds

(Specified Range is 1 to 3 minutes)

2. FMVSS 301 Position Hold Time = 5 minutes, 0 seconds

3. TOTAL = 6 minutes, 34 seconds

4. NEXT WHOLE MINUTE INTERVAL = 7 minutes



Actual Test Vehicle Stoddard Solvent Spillage:

1. First 5 minutes from onset of rotation = 0 oz. (5 oz. allowed)

2. 6th minute = 0 oz. (1 oz. allowed)

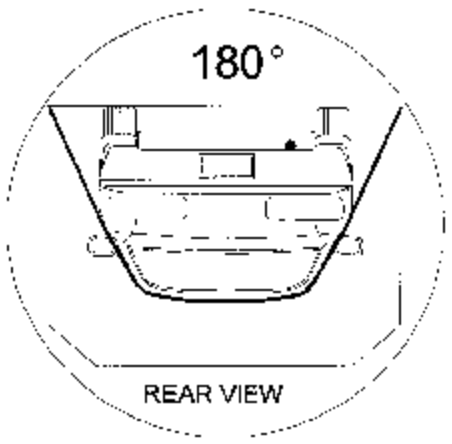
3. 7th minute = 0 oz. (1 oz. allowed)

4. 8th minute (if required) = N/A oz. (1 oz. allowed)

Provide Details of Stoddard Solvent Spillage Locations — NONE

DATA SHEET 5 CONTINUED

C. Test Phase = 180° to 270°



Determination of Stoddard Solvent Collection Time Period:

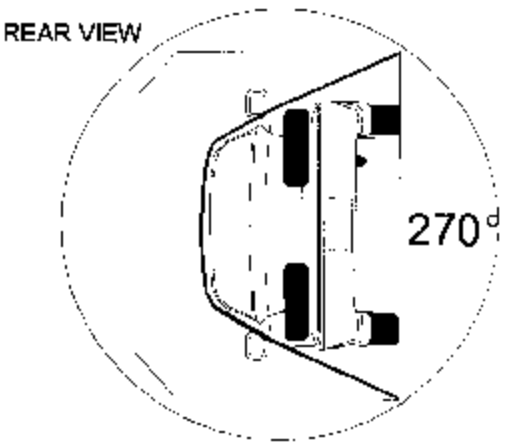
1. Rollover Fixture 90° Rotation Time = 1 minutes, 28 seconds

(Specified Range is 1 to 3 minutes)

2. FMVSS 301 Position Hold Time = 5 minutes, 0 seconds

3. TOTAL = 6 minutes, 28 seconds

4. NEXT WHOLE MINUTE INTERVAL = 7 minutes



Actual Test Vehicle Stoddard Solvent Spillage:

1. First 5 minutes from onset of rotation = 0 oz. (5 oz. allowed)

2. 6th minute = 0 oz. (1 oz. allowed)

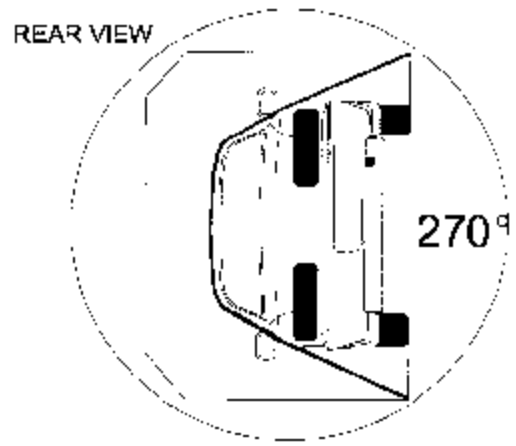
3. 7th minute = 0 oz. (1 oz. allowed)

4. 8th minute (if required) = N/A oz. (1 oz. allowed)

Provide Details of Stoddard Solvent Spillage Locations — NONE

DATA SHEET 5 CONTINUED

D. Test Phase = 270° to 360°



Determination of Stoddard Solvent Collection Time Period:

1. Rollover Fixture 90° Rotation Time = 1 minutes, 45 seconds

(Specified Range is 1 to 3 minutes)

2. FMVSS 301 Position Hold Time = 5 minutes, 0 seconds

3. TOTAL = 6 minutes, 45 seconds

4. NEXT WHOLE MINUTE INTERVAL = 7 minutes

Actual Test Vehicle Stoddard Solvent Spillage:

1. First 5 minutes from onset of rotation = 0 oz.
   (5 oz. allowed)

2. 6th minute = 0 oz.
   (1 oz. allowed)

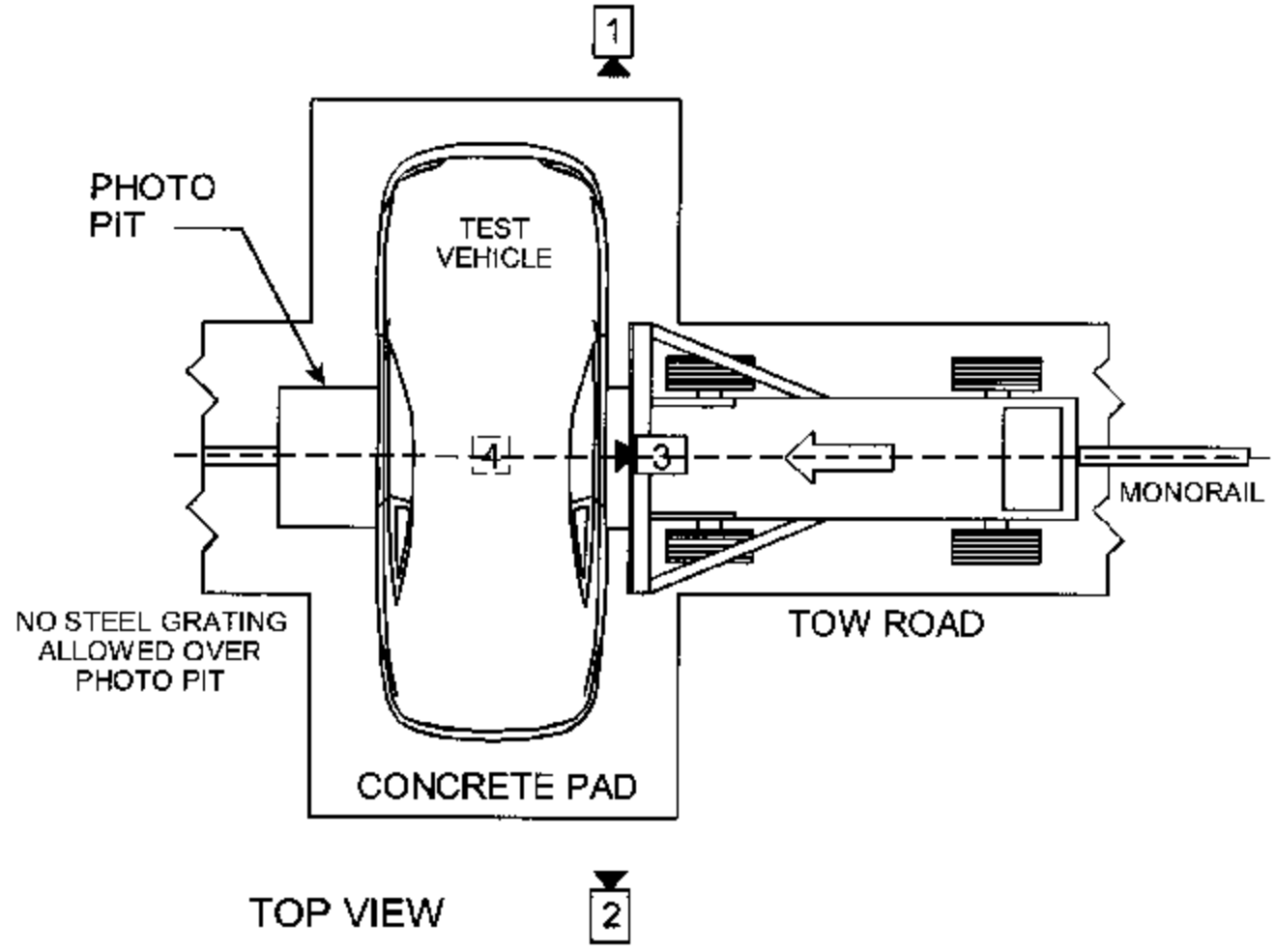
3. 7th minute = 0 oz.
   (1 oz. allowed)

4. 8th minute (if required) = N/A oz. (1 oz. allowed)

Provide Details of Stoddard Solvent Spillage Locations — NONE

DATA SHEET 6
CAMERA LOCATION

VEHICLE NHTSA NO.: C35103 TEST DATE: 06/03/03



CAMERA 1 – REAR SIDE VIEW OF VEHICLE DURING CRASH
CAMERA 2 – FRONT SIDE VIEW OF VEHICLE DURING CRASH
CAMERA 3 – OVERHEAD VIEW OF ENTIRE IMPACT
CAMERA 4 – UNDERBODY VIEW OF FUEL TANK LOCATED IN PIT

SECTION 4
INSTRUMENTATION AND EQUIPMENT LIST

TABLE 1 - INSTRUMENTATION & EQUIPMENT LIST

EQUIPMENT	DESCRIPTION	MODEL/ SERIAL NO.	CAL. DATE	NEXT CAL. DATE
COUNTER/TIMER	SYSTRON DONNER	19 353-10	04/03	04/04
COUNTER/TIMER	SYSTRON DONNER	19 353- 11	03/03	03/04
SPEED TRAP 2	GTL ST1	N/A	08/02	08/03
SPEED TRAP 3	GTL ST2	N/A	08/02	08/03
STOP WATCH	ACCUSPLIT	ACT 1 A&B	05/03	05/04
STOP WATCH	ACCUSPLIT	ACT 2 A&B	05/03	05/04
SCALES	INTERCOMP	199744	05/03	05/04
TIRE PRESSURE GAUGE	WEKSLER	0-100	05/03	05/04
STEEL SCALES	STARRETT	C416R	05/03	05/04
STEEL TAPE	STANLEY	GF2	05/03	05/04
LEVEL	STANLEY	42-449	05/03	05/04
TEMP. INDICATOR	OMEGA	B/5562/14/1	05/03	05/04
TEMP. RECORDER	OMEGA	B/5562/14/1	05/03	05/04

SECTION 5

PHOTOGRAPHS

2003 TOYOTA HIGHLANDER
NHTSA NO. C35103
FMVSS NO. 301

FIGURE 5.1
FRONT VIEW OF VEHICLE PRE-TEST

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NHTSA NO. C35103
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FIGURE 5.2
LEFT SIDE VIEW OF VEHICLE PRE-TEST

2003 TOYOTA HIGHLANDER
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FMVSS NO. 301L

FIGURE 5.3
RIGHT SIDE VIEW OF VEHICLE PRE-TEST

2003 TOYOTA HIGHLANDER
NHTSA NO. C35103
FMVSS NO. 301L

FIGURE 5.4
REAR VIEW OF VEHICLE PRE-TEST

2003 TOYOTA HIGHLANDER
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FIGURE 5.5
¾ FRONTAL VIEW FROM LEFT SIDE OF
VEHICLE PRE-TEST

2003 TOYOTA HIGHLANDER
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FIGURE 5.6
¾ REAR VIEW FROM RIGHT SIDE OF VEHICLE PRE-TEST

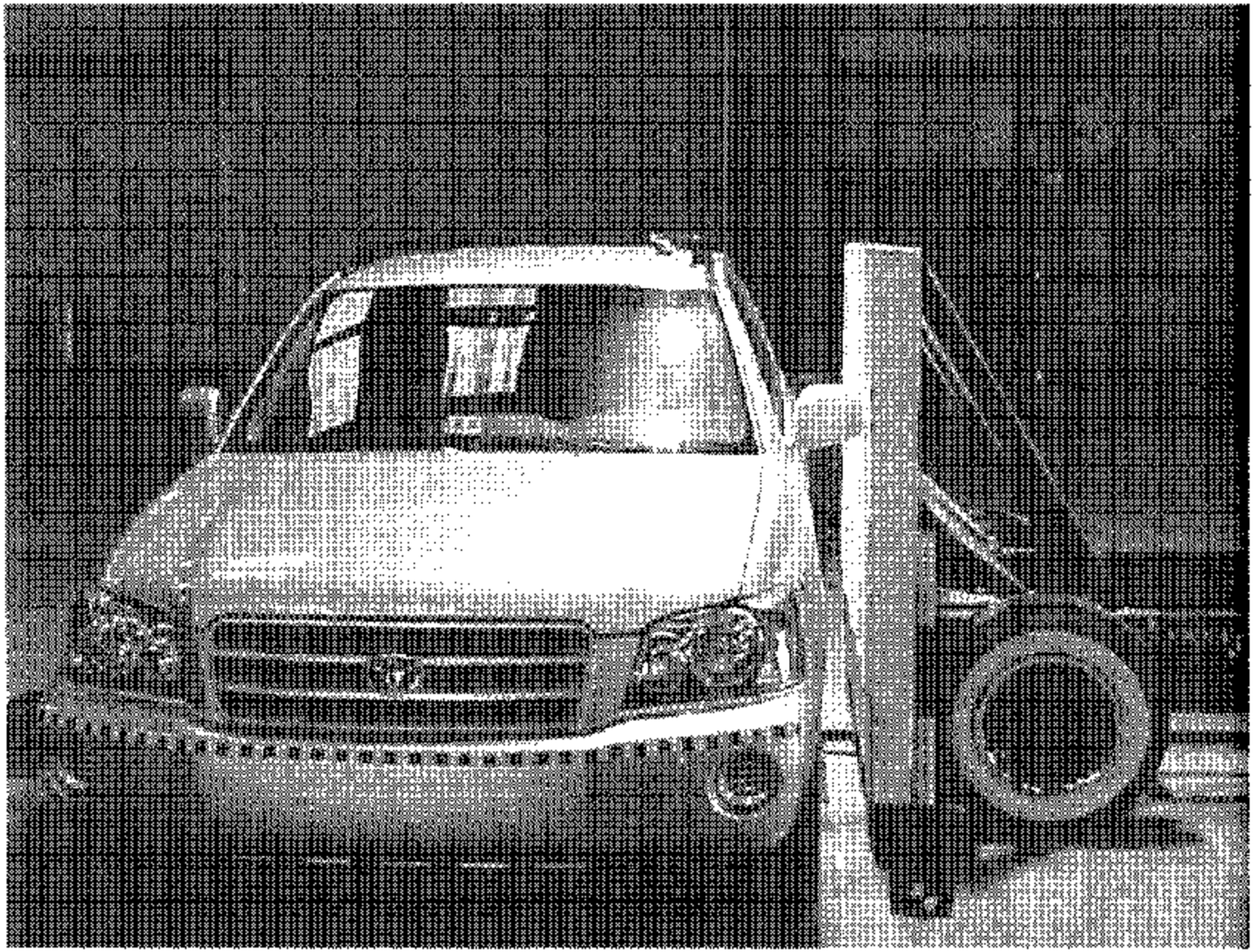

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FIGURE 5.7
LEFT VIEW OF VEHICLE/BARRIER
PRE-TEST

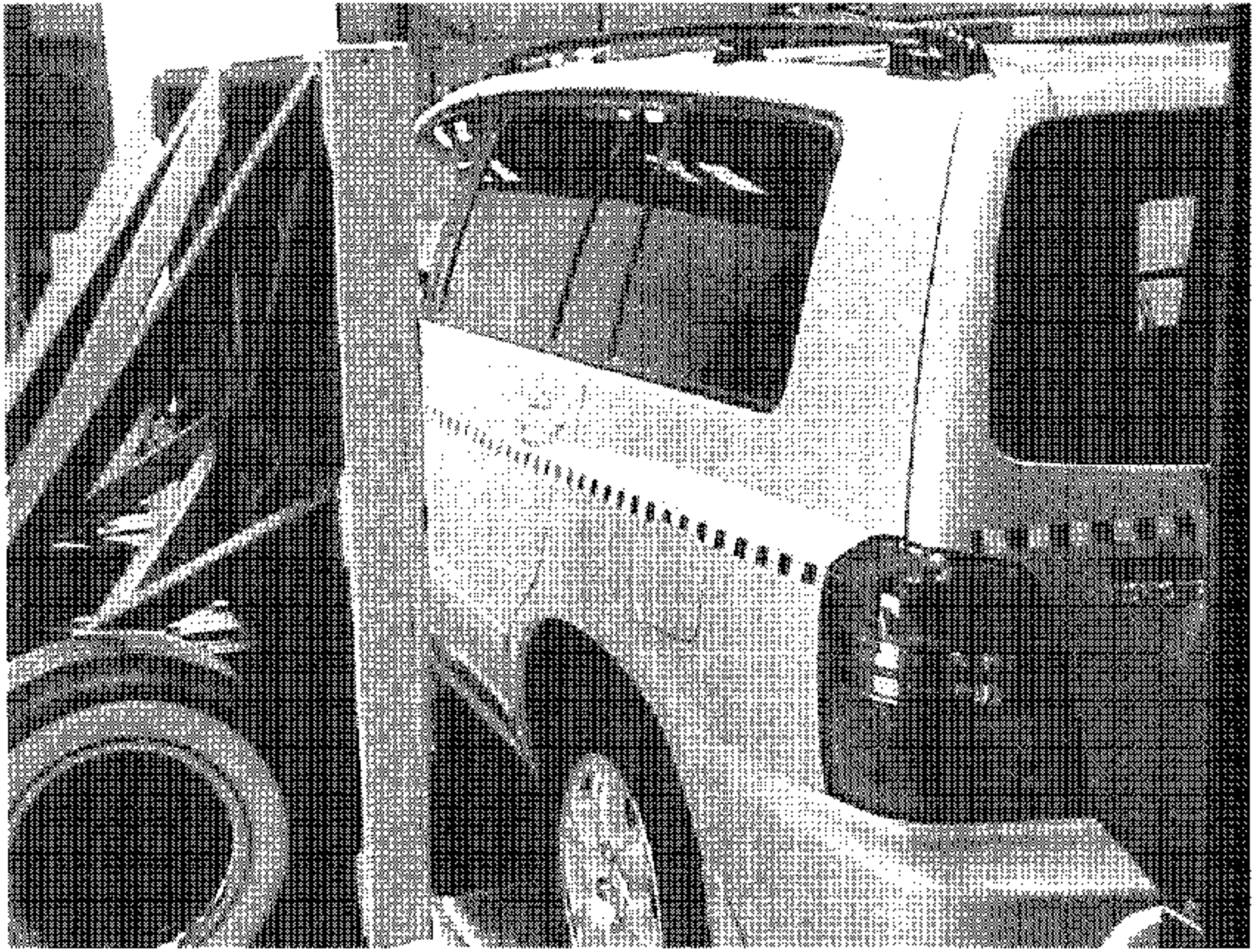

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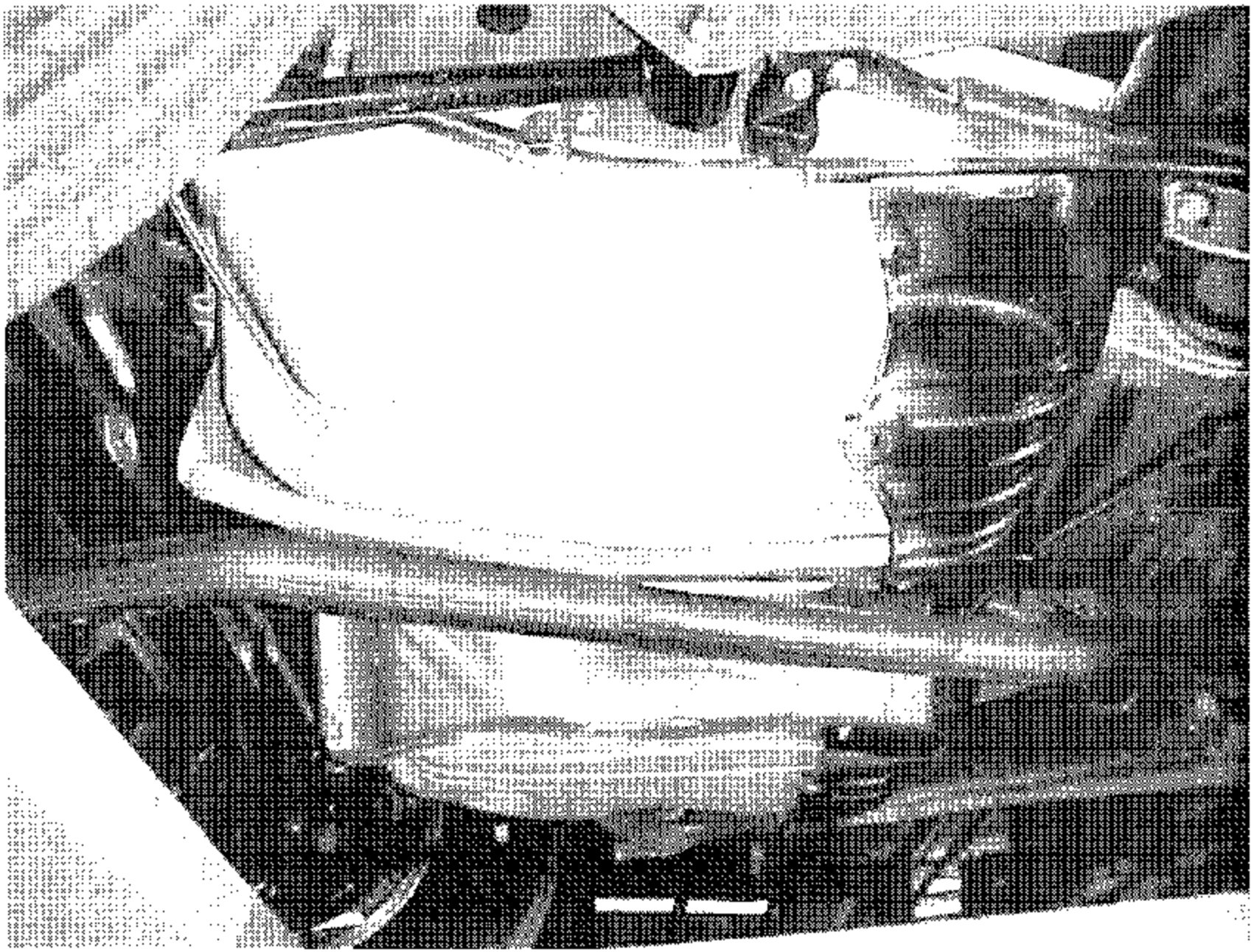
FIGURE 5.8
RIGHT VIEW OF VEHICLE/BARRIER
PRE-TEST



2003 TOYOTA HIGHLANDER
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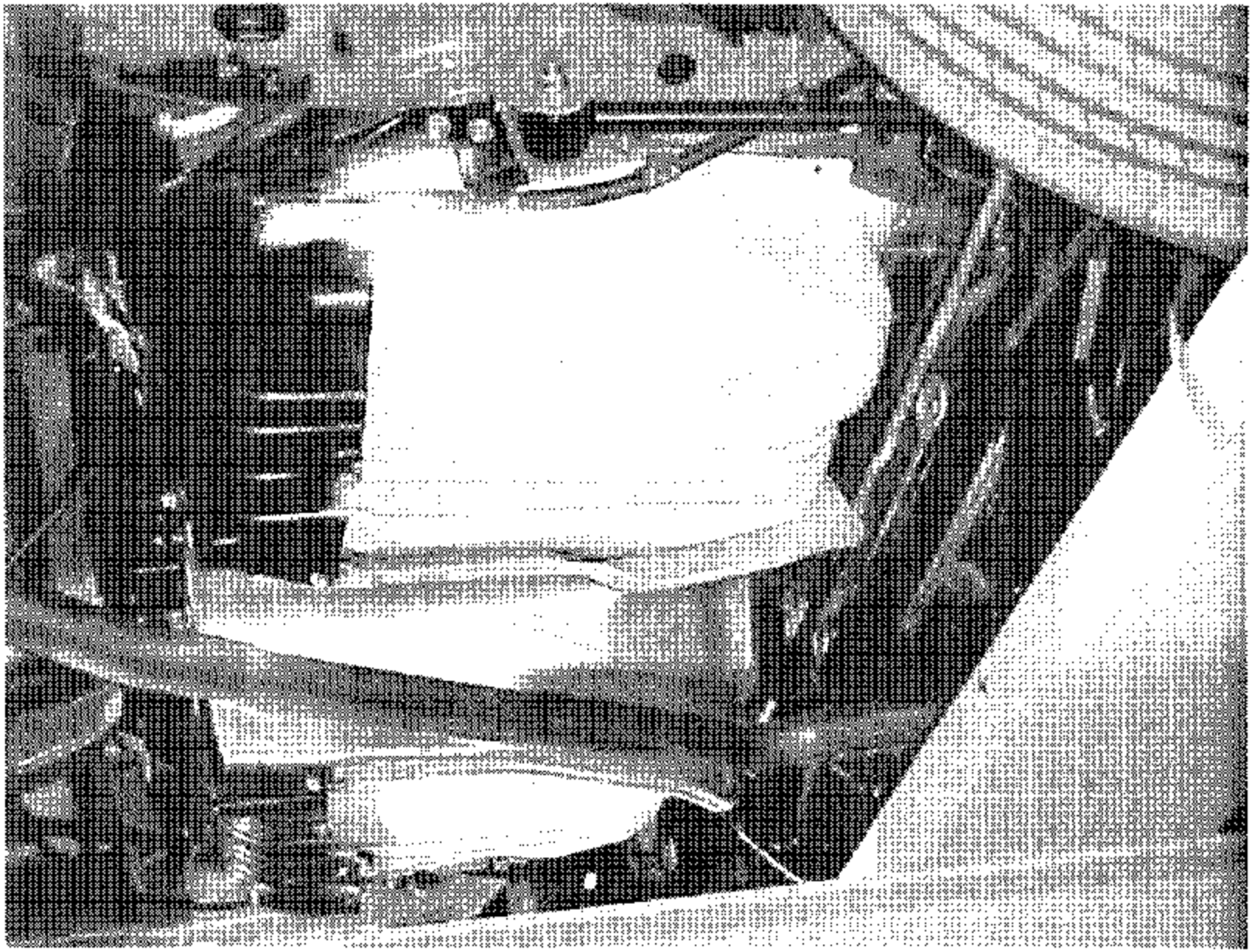
FIGURE 5.9
UNDERBODY VIEW OF FUEL TANK RIGHT
VIEW PRE-TEST



2003 TOYOTA HIGHLANDER
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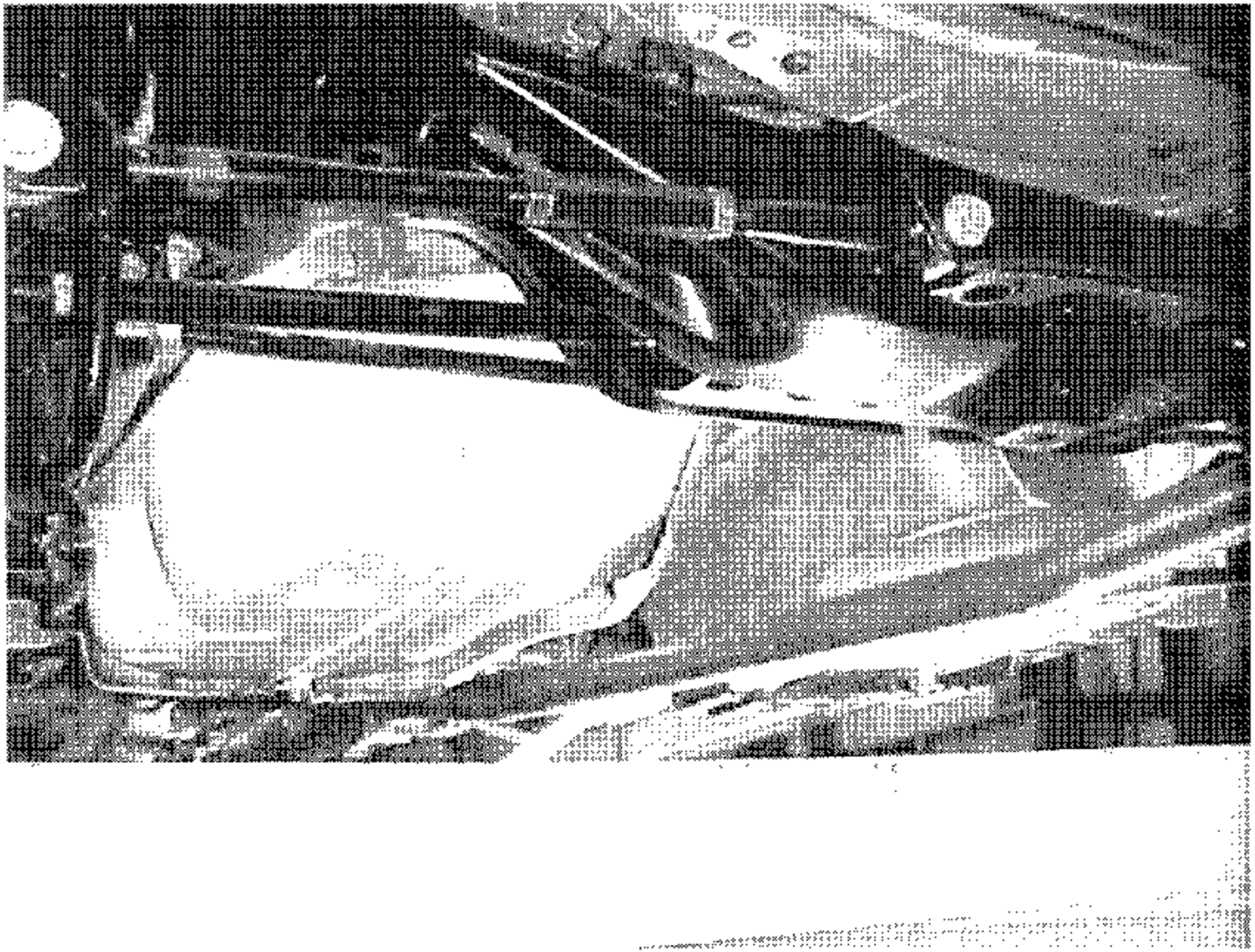
FIGURE 5.10
UNDERBODY VIEW OF FUEL TANK LEFT
VIEW PRE-TEST



2003 TOYOTA HIGHLANDER
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FIGURE 5.11
UNDERBODY VIEW OF FUEL TANK REAR
VIEW PRE-TEST

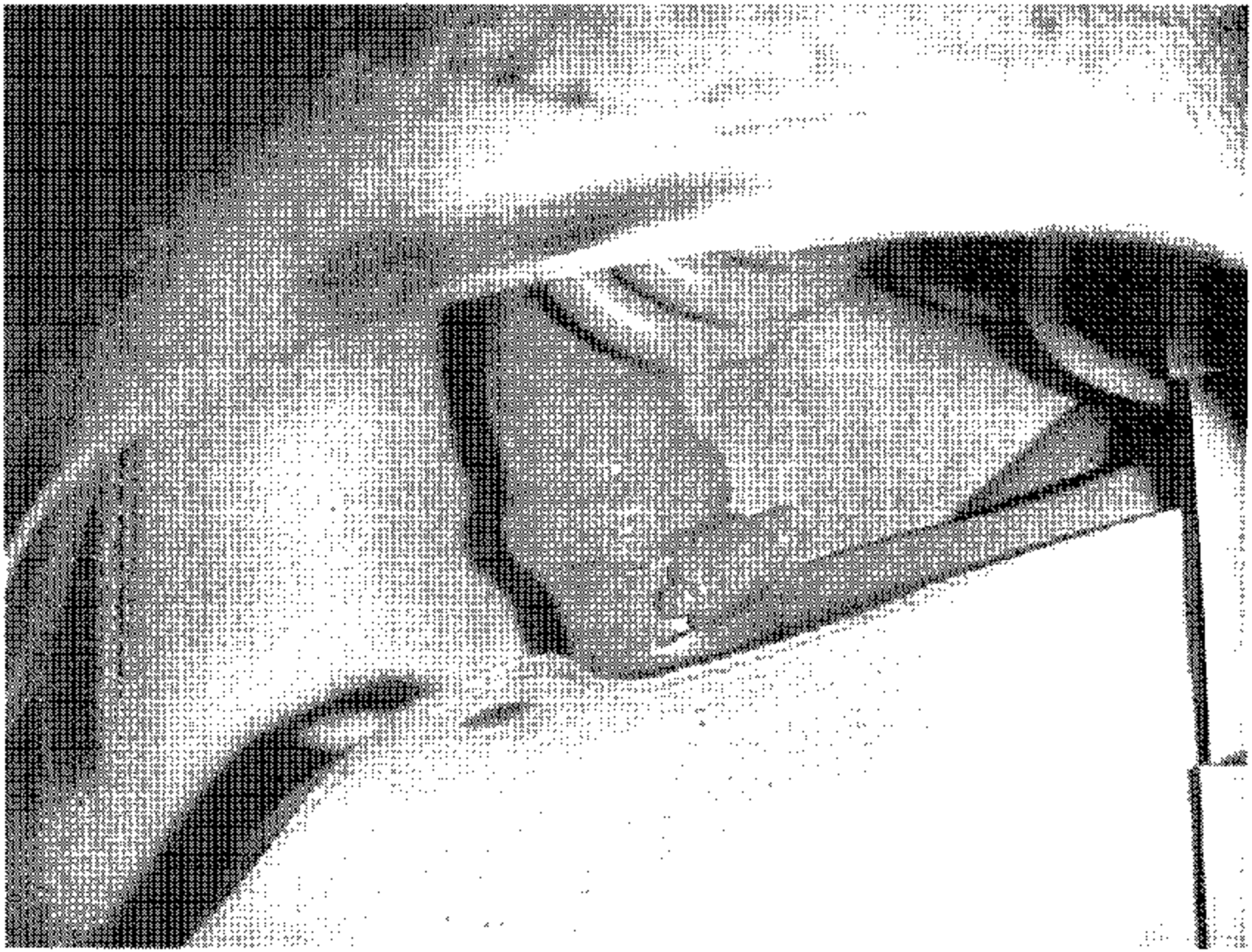

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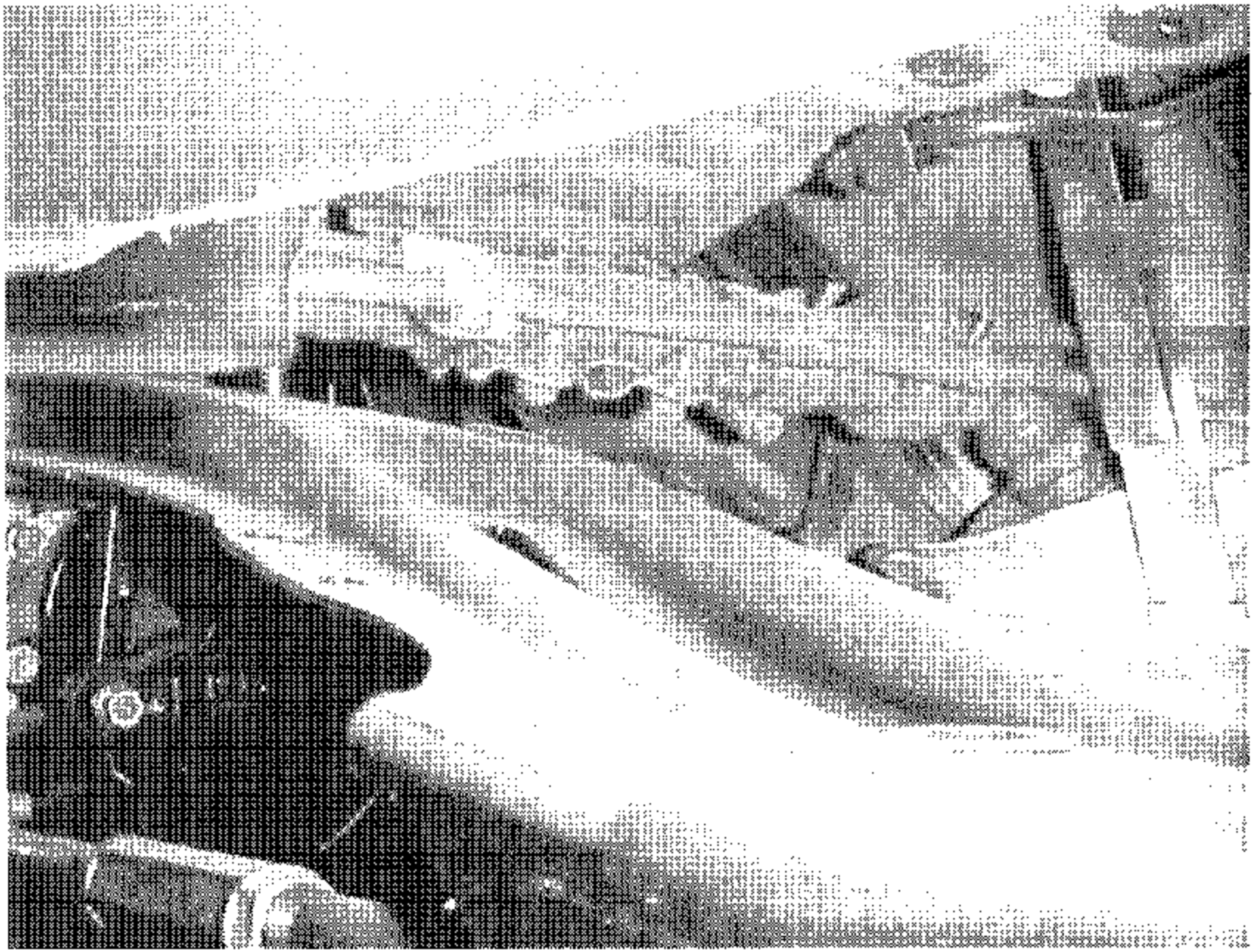
FIGURE 5.12
UNDERBODY VIEW OF FUEL FILL HOSE
AT TANK PRE-TEST



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NHTSA NO. C35103
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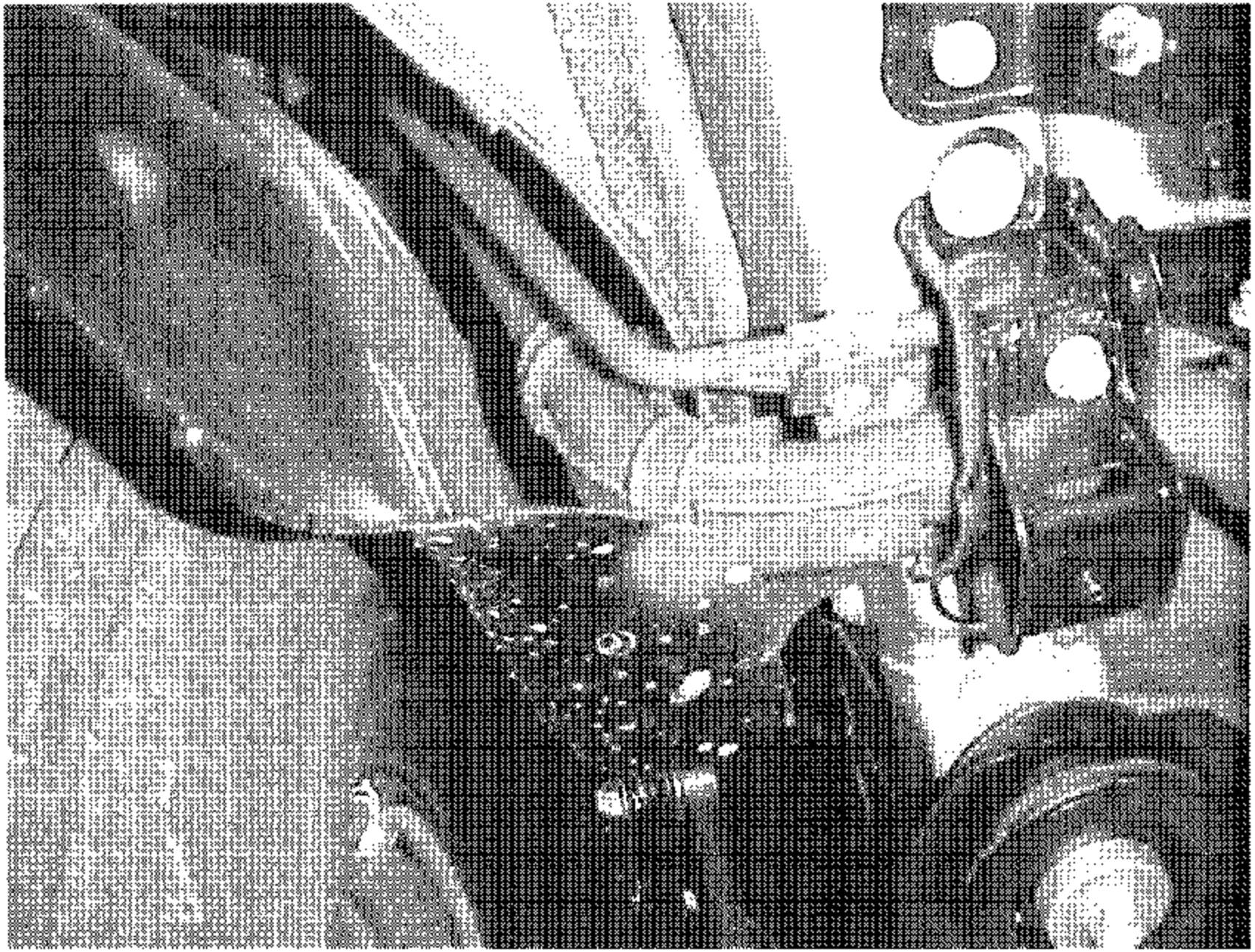
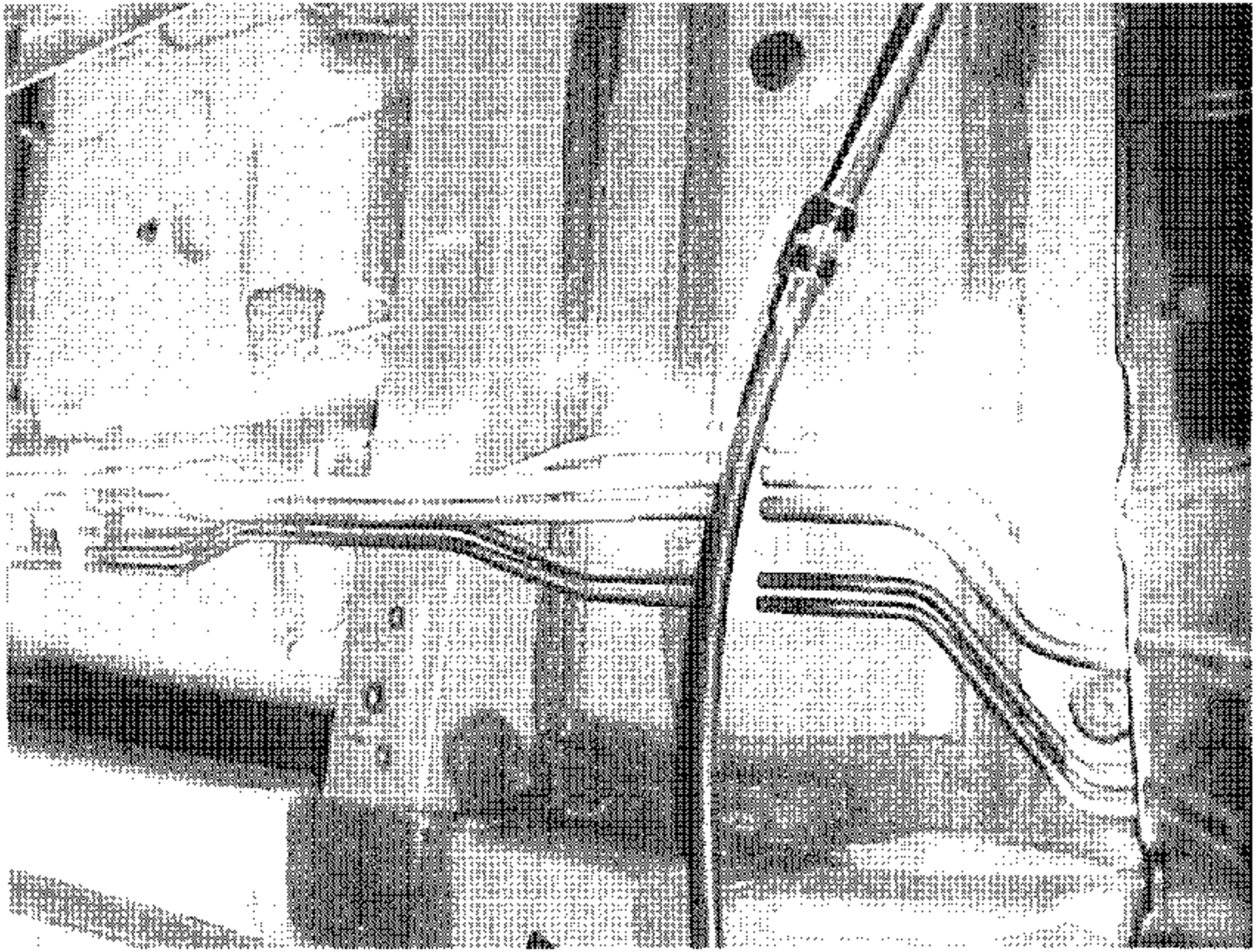
FIGURE 5.13
UNDERBODY VIEW OF FUEL FILL HOSE
IN CENTER PRE-TEST



2003 TOYOTA HIGHLANDER
NHTSA NO. C35103
FMVSS NO. 301

FIGURE 5.14
UNDERBODY VIEW OF FUEL FILL HOSE AT FILL PRE-TEST



2003 TOYOTA HIGHLANDER
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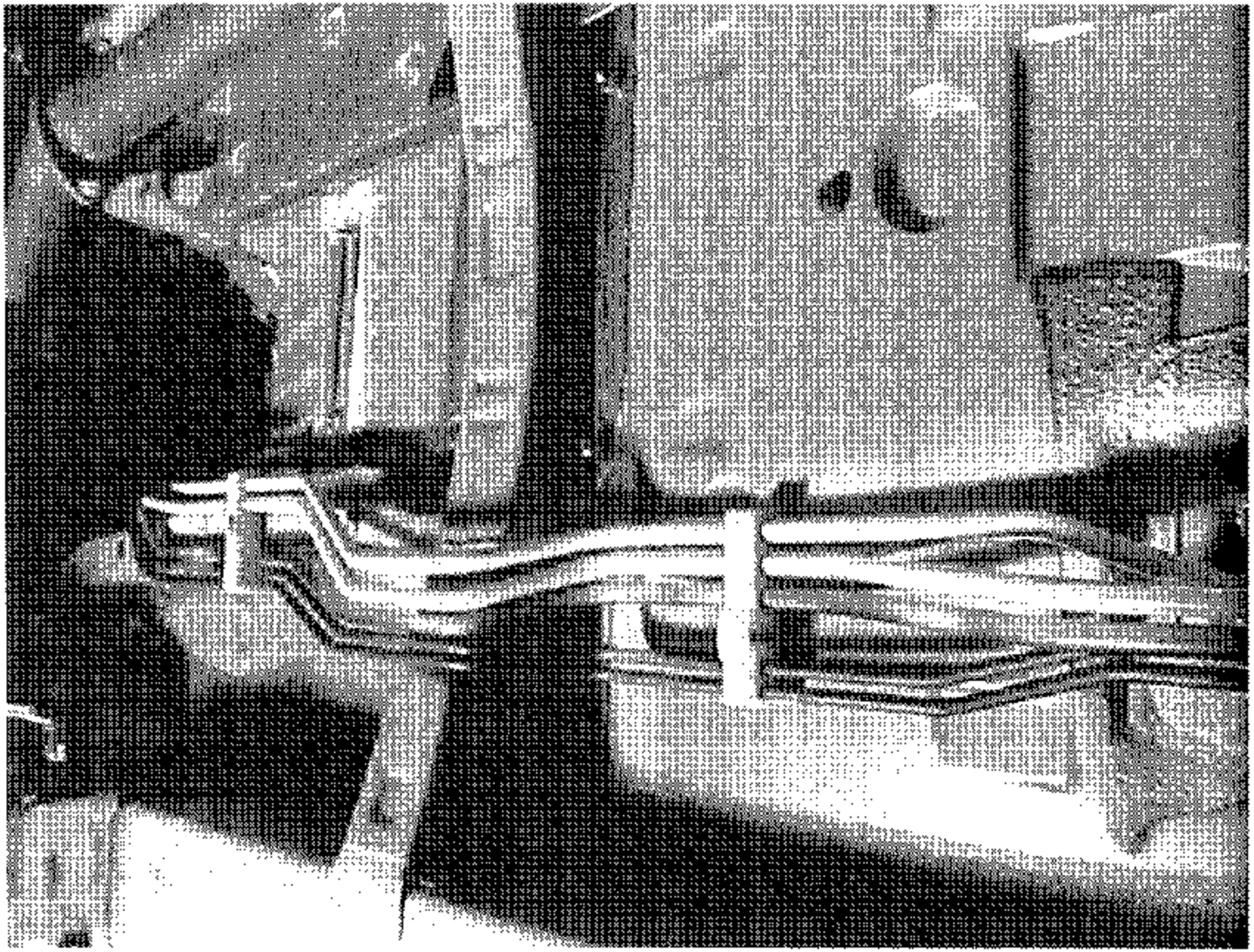
FMVSS NO. 301

FIGURE 5.15
UNDERBODY VIEW OF FUEL LINES AT
TANK PRE-TEST



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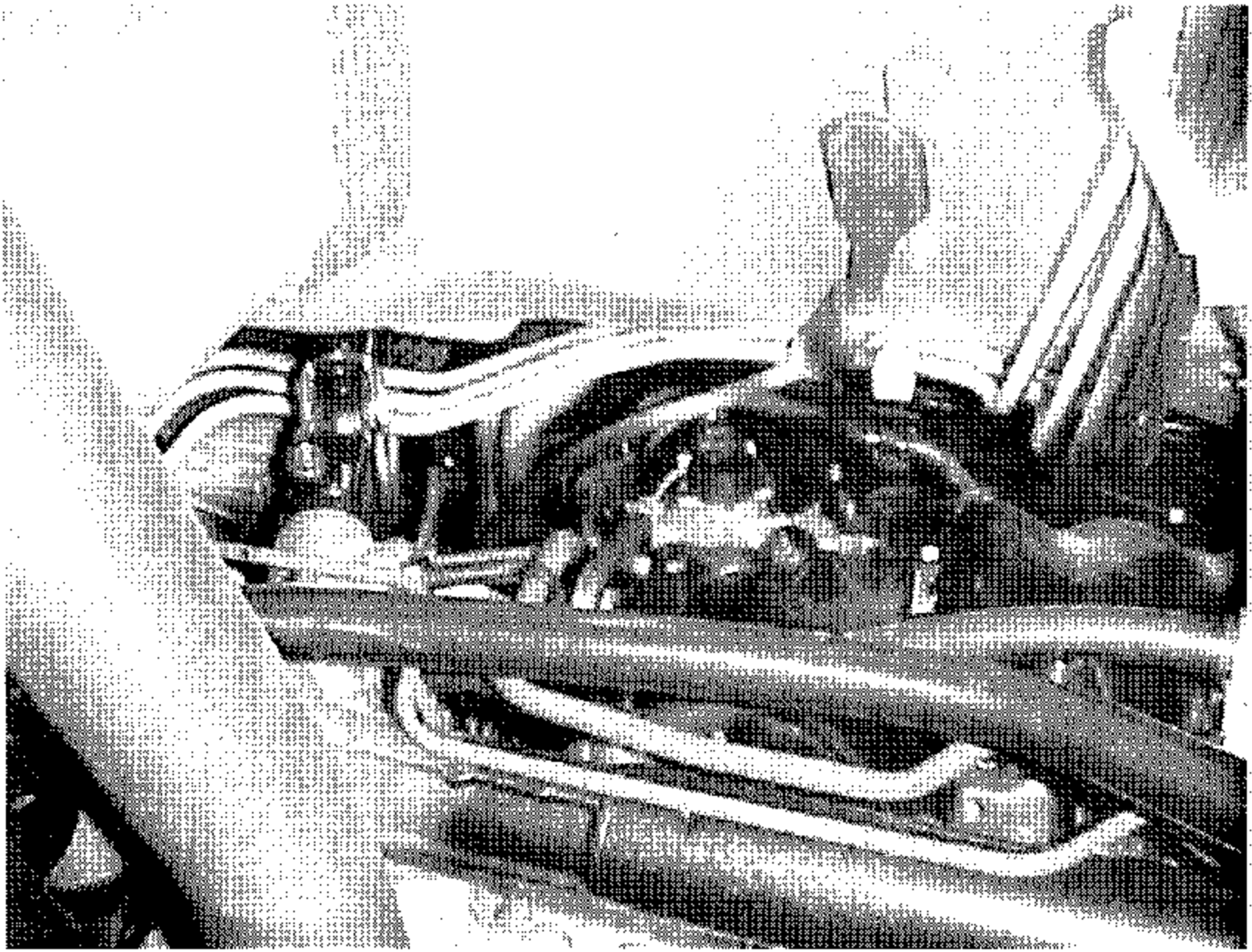
FMVSS NO. 301L

FIGURE 5.16
UNDERBODY VIEW OF FUEL LINES IN
CENTER PRE-TEST



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NHTSA NO. C35103
FMVSS NO. 301L

FIGURE 5.17
UNDERBODY VIEW OF FUEL LINES TO ENGINE PRE-TEST

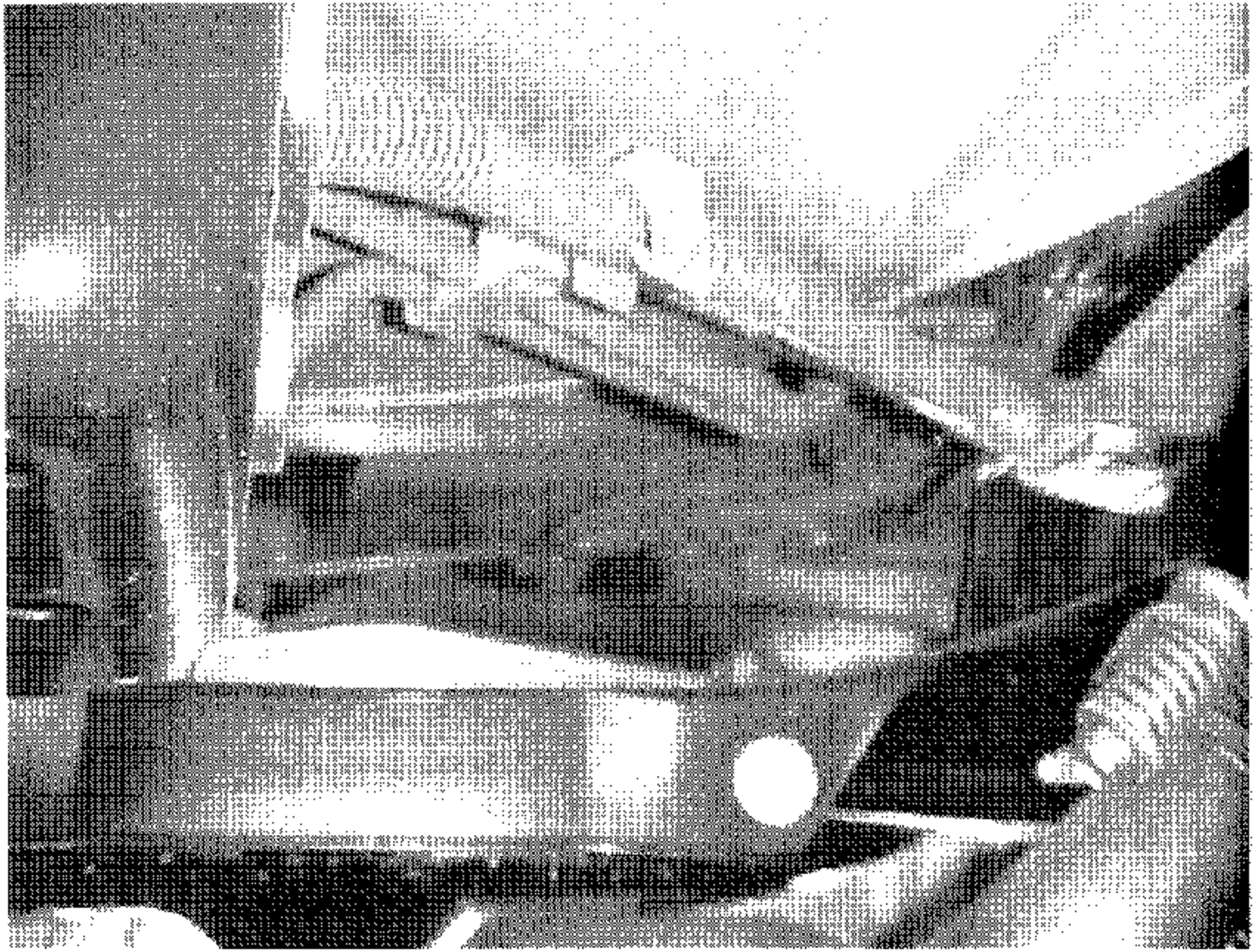

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FIGURE 5.18
UNDERBODY VIEW OF VAPOR LINES
PRE-TEST

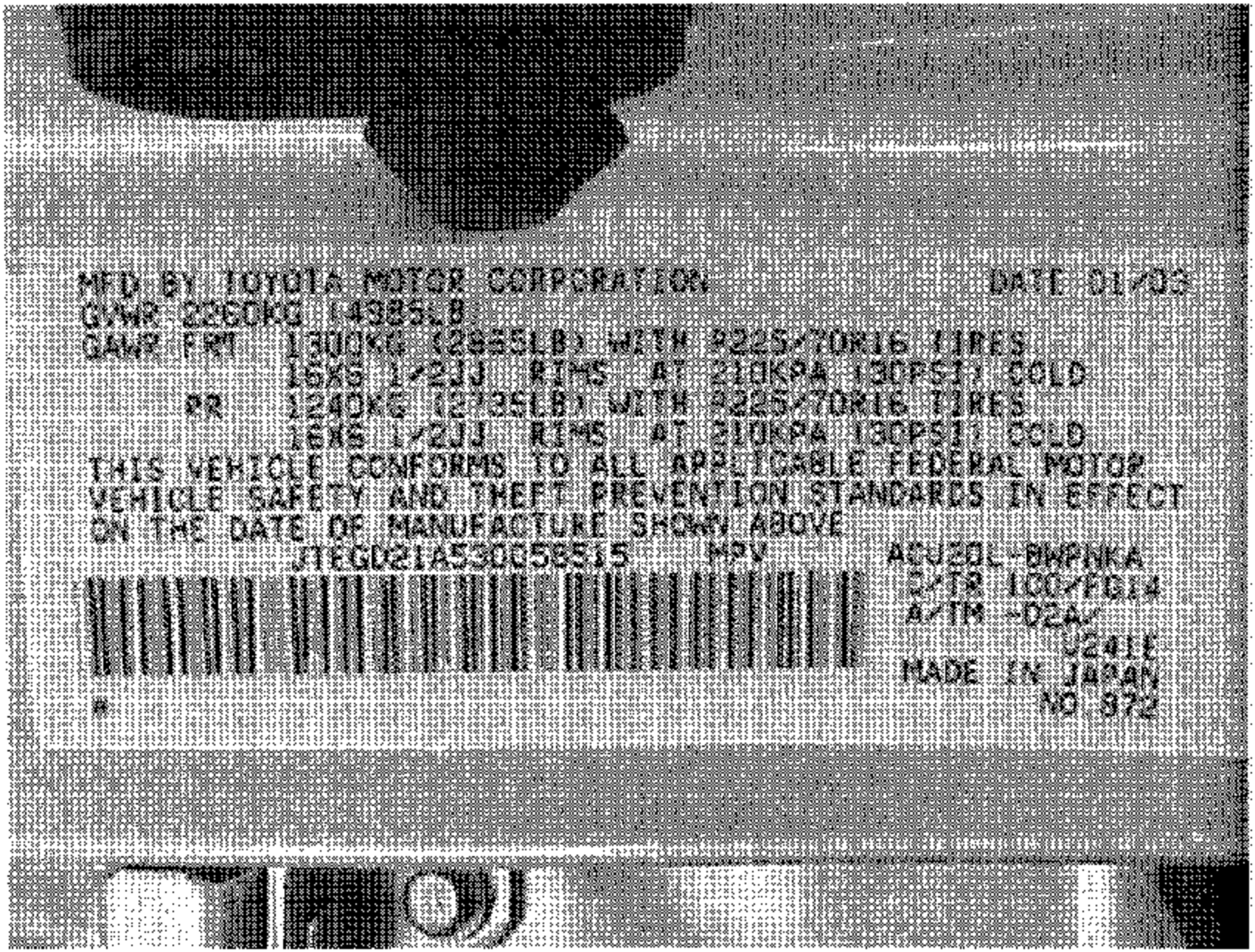

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FIGURE 5.19
VEHICLE CERTIFICATION LABEL

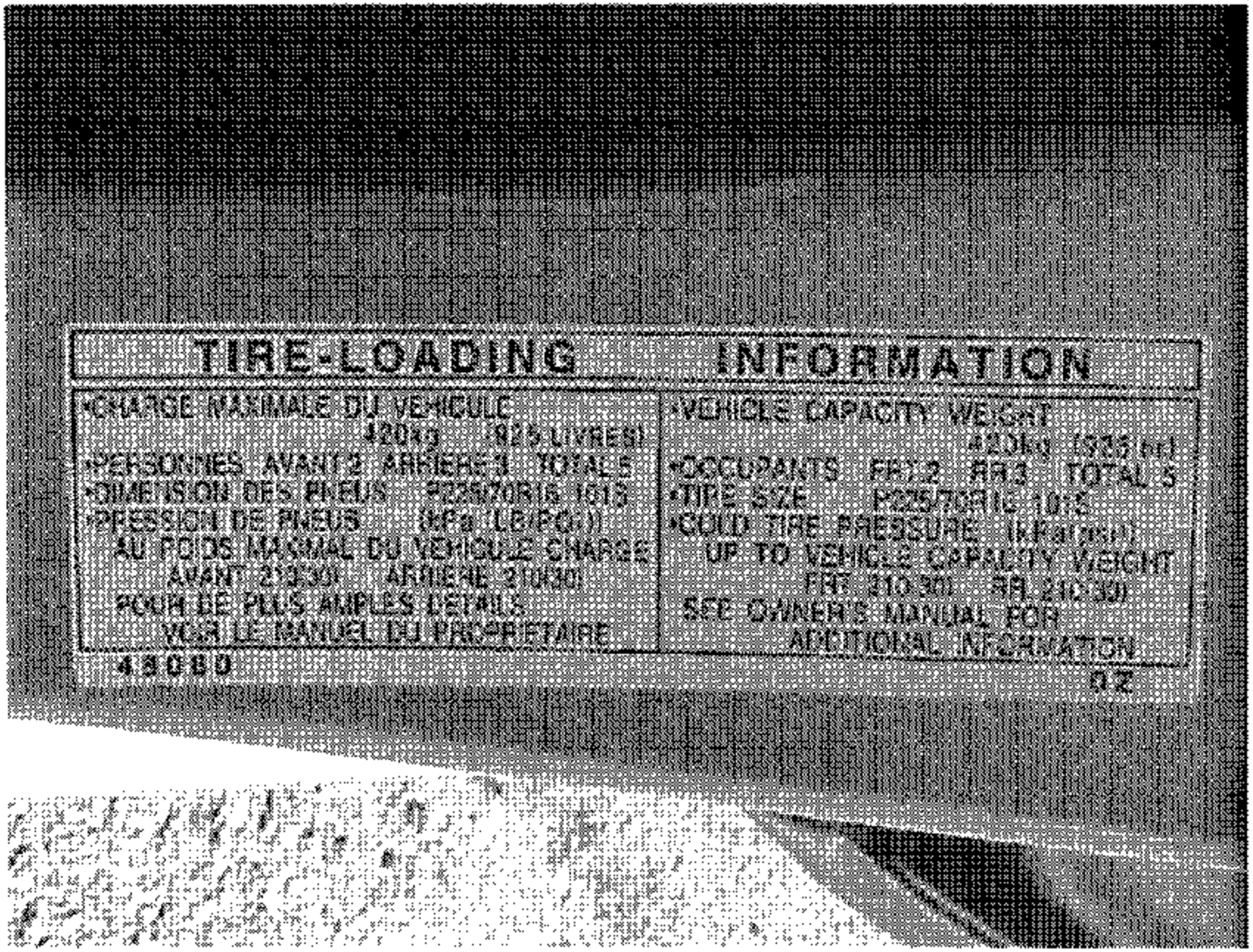

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FIGURE 5.20
VEHICLE TIRE INFORMATION LABEL

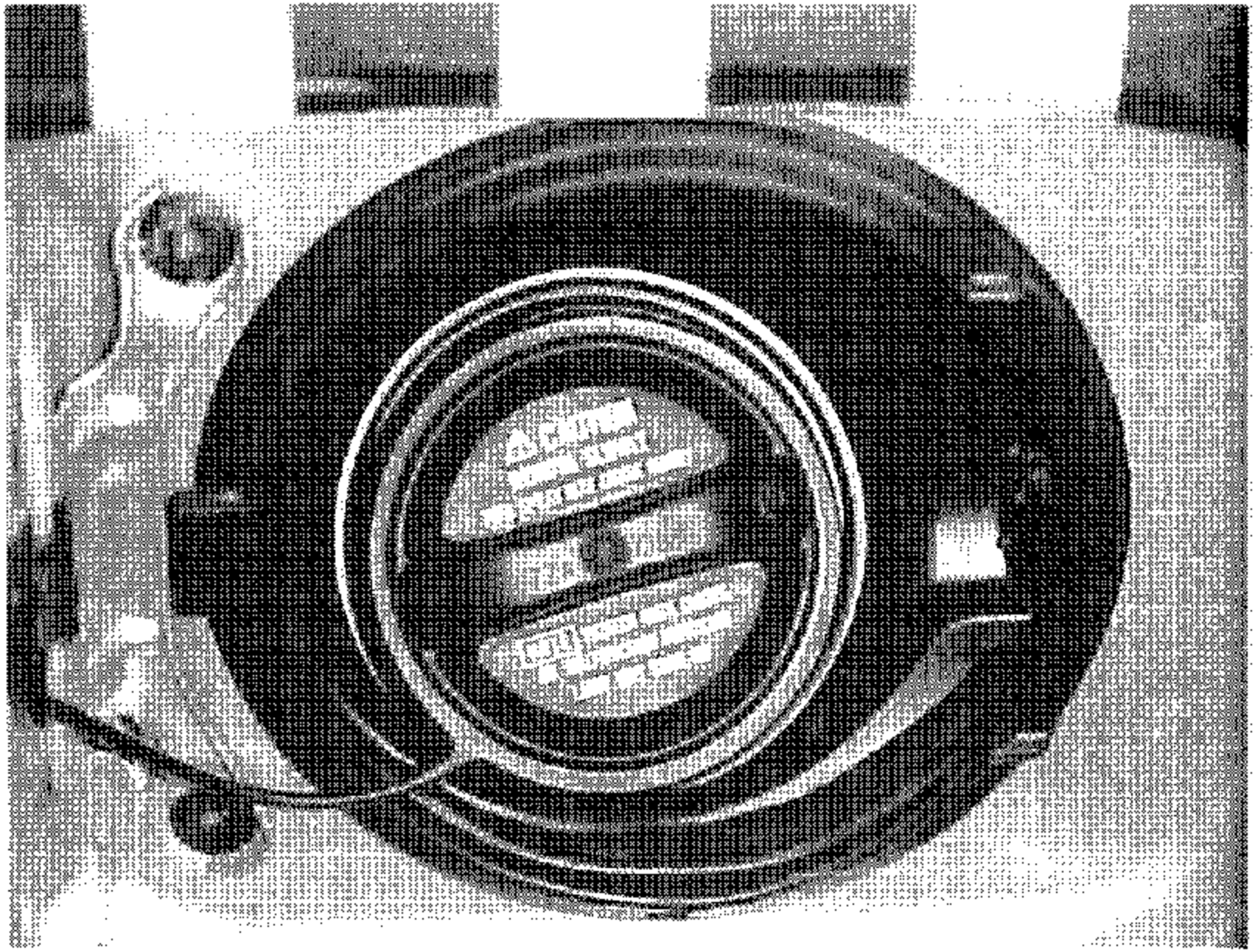

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FIGURE 5.21
VEHICLE FUEL CAP PRE-TEST

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FIGURE 5.22
FRONT VIEW OF VEHICLE POST TEST

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FIGURE 5.23
LEFT SIDE VIEW OF VEHICLE POST TEST

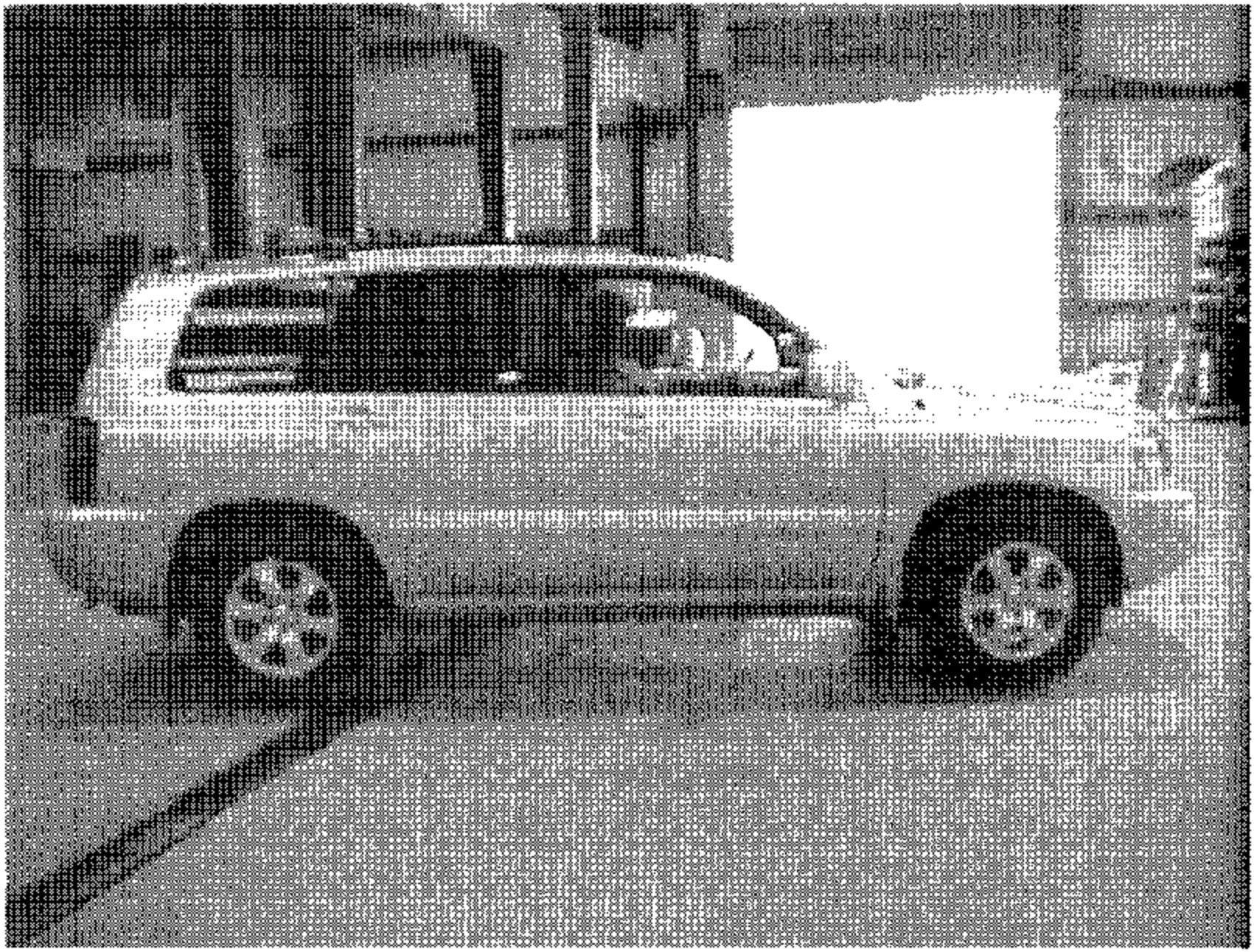

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FIGURE 5.24
RIGHT SIDE VIEW OF VEHICLE POST TEST

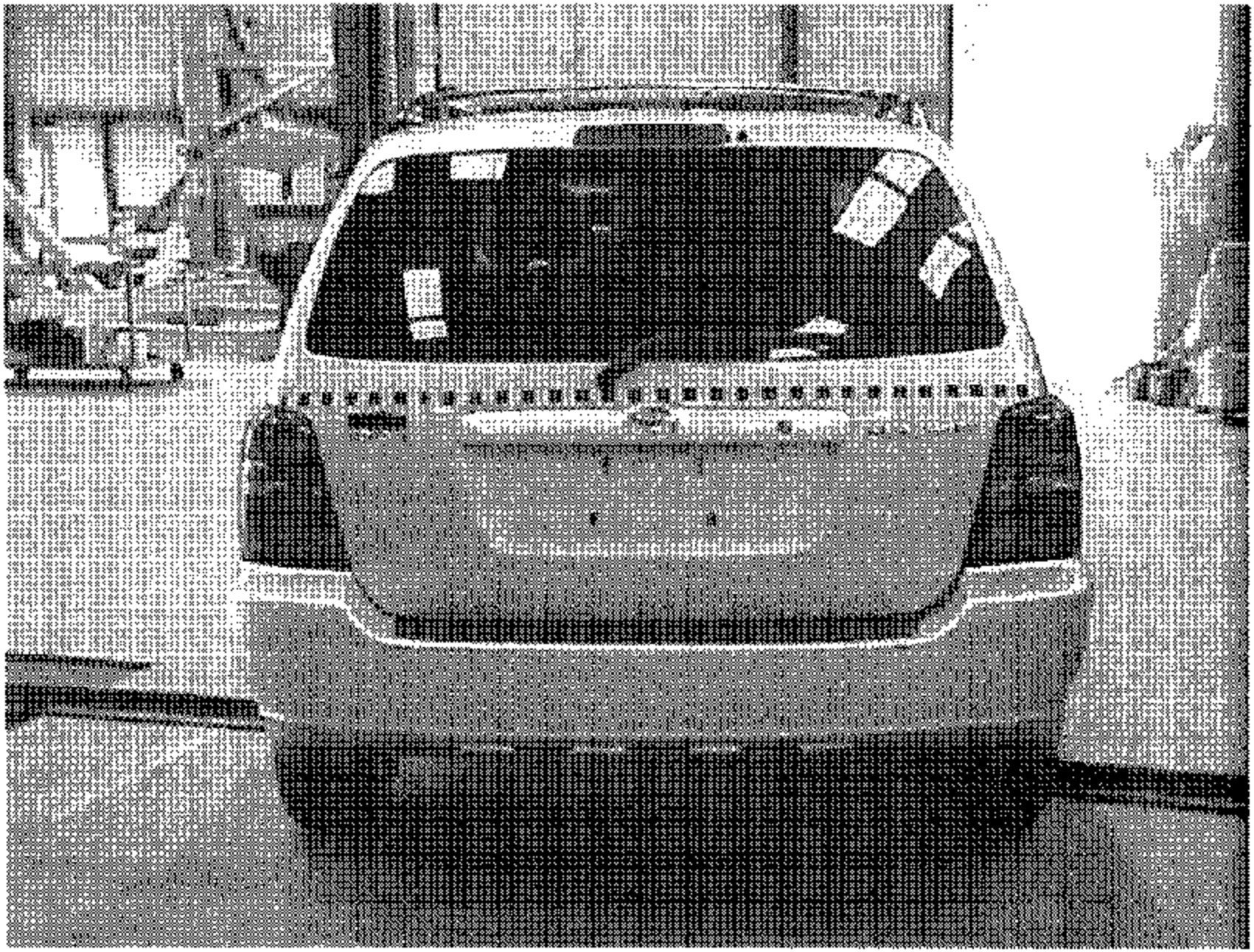

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FIGURE 5.25
REAR VIEW OF VEHICLE POST TEST

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FMVSS NO. 301L

FIGURE 5.26
¾ FRONTAL VIEW FROM LEFT SIDE OF VEHICLE POST TEST

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FIGURE 5.27
¾ REAR VIEW FROM RIGHT SIDE OF
VEHICLE POST TEST

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FIGURE 5.28
LEFT VIEW OF VEHICLE/BARRIER
POST TEST

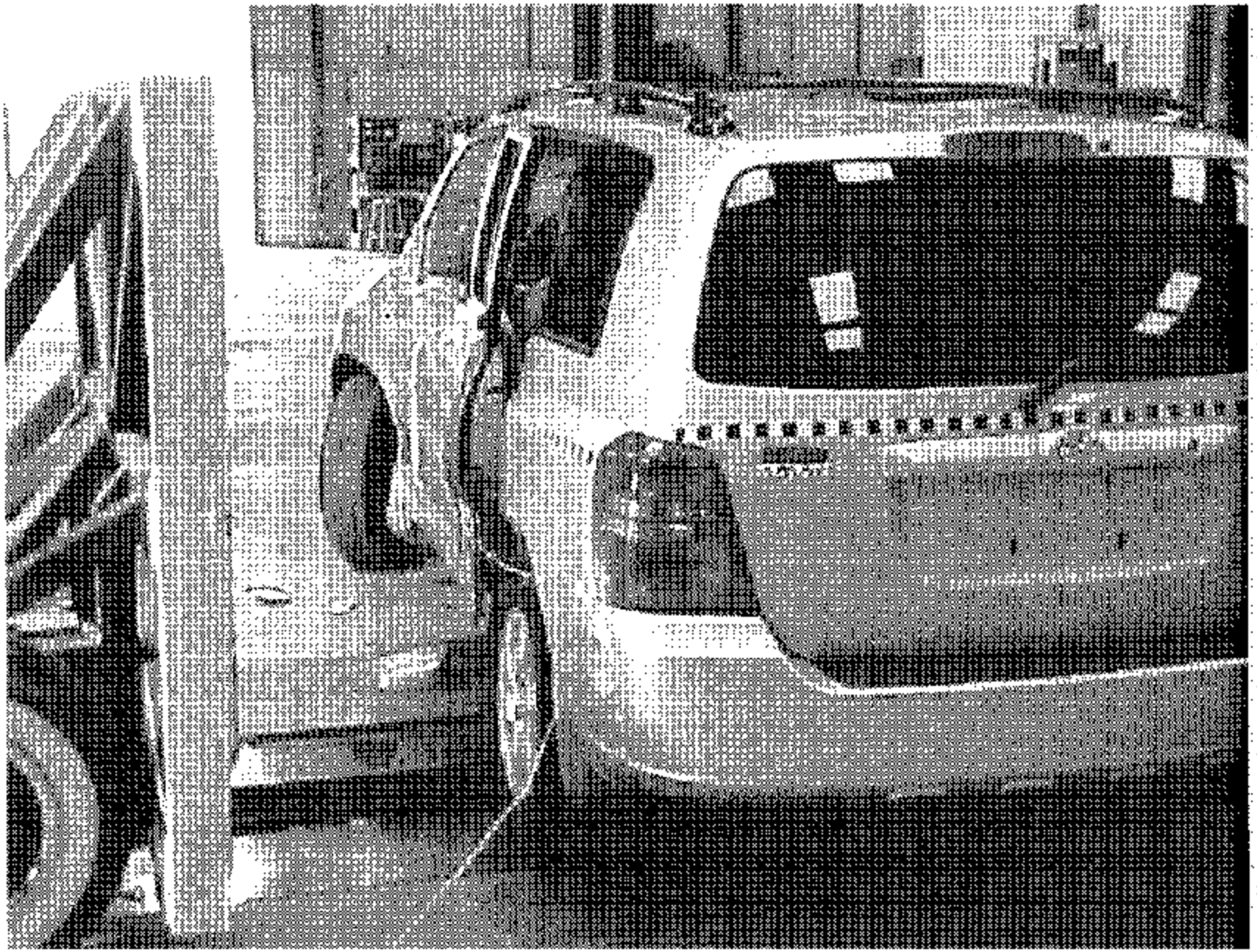

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FIGURE 5.29
RIGHT VIEW OF VEHICLE/BARRIER
POST TEST

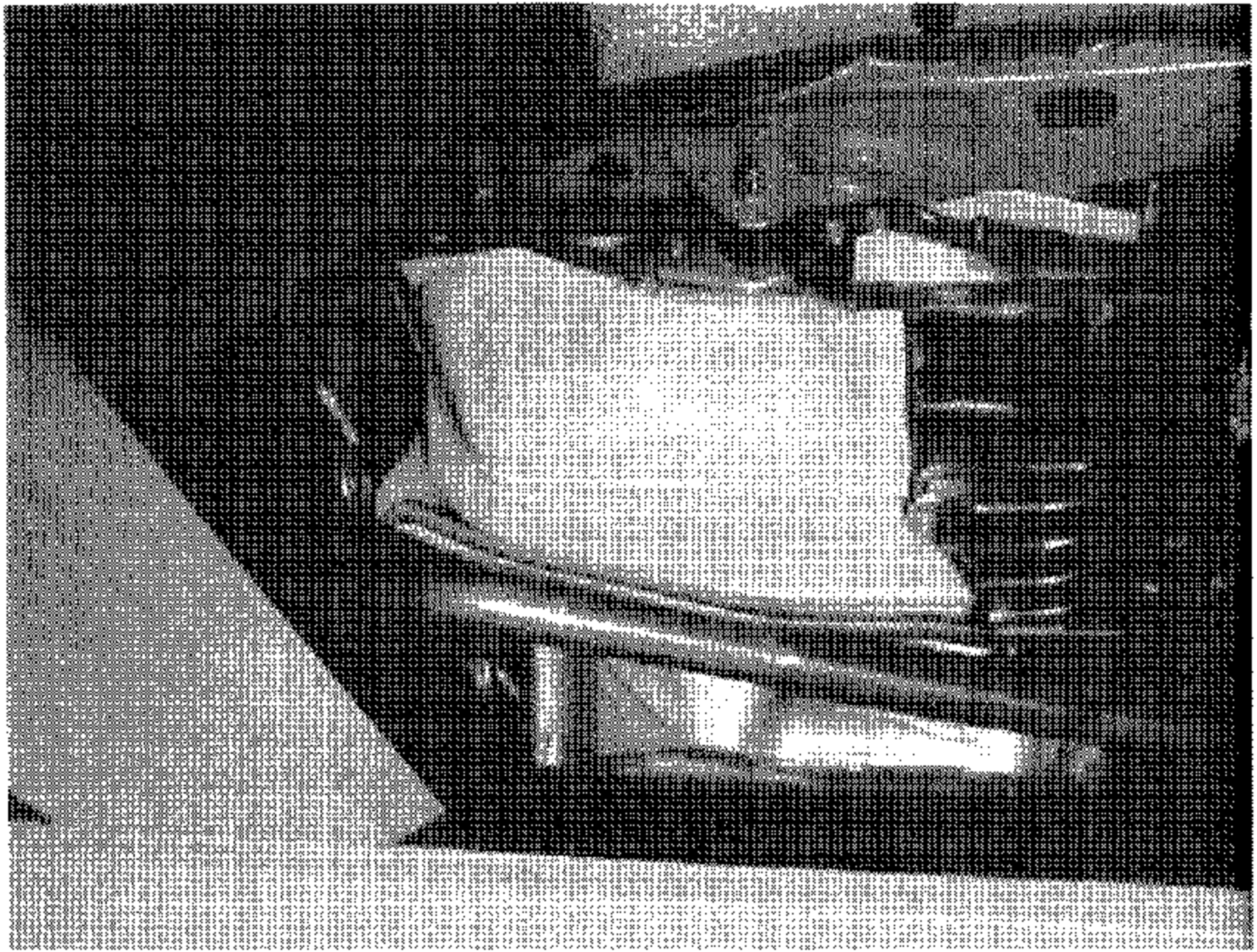

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FIGURE 5.30
UNDERBODY VIEW OF FUEL TANK RIGHT
VIEW POST TEST

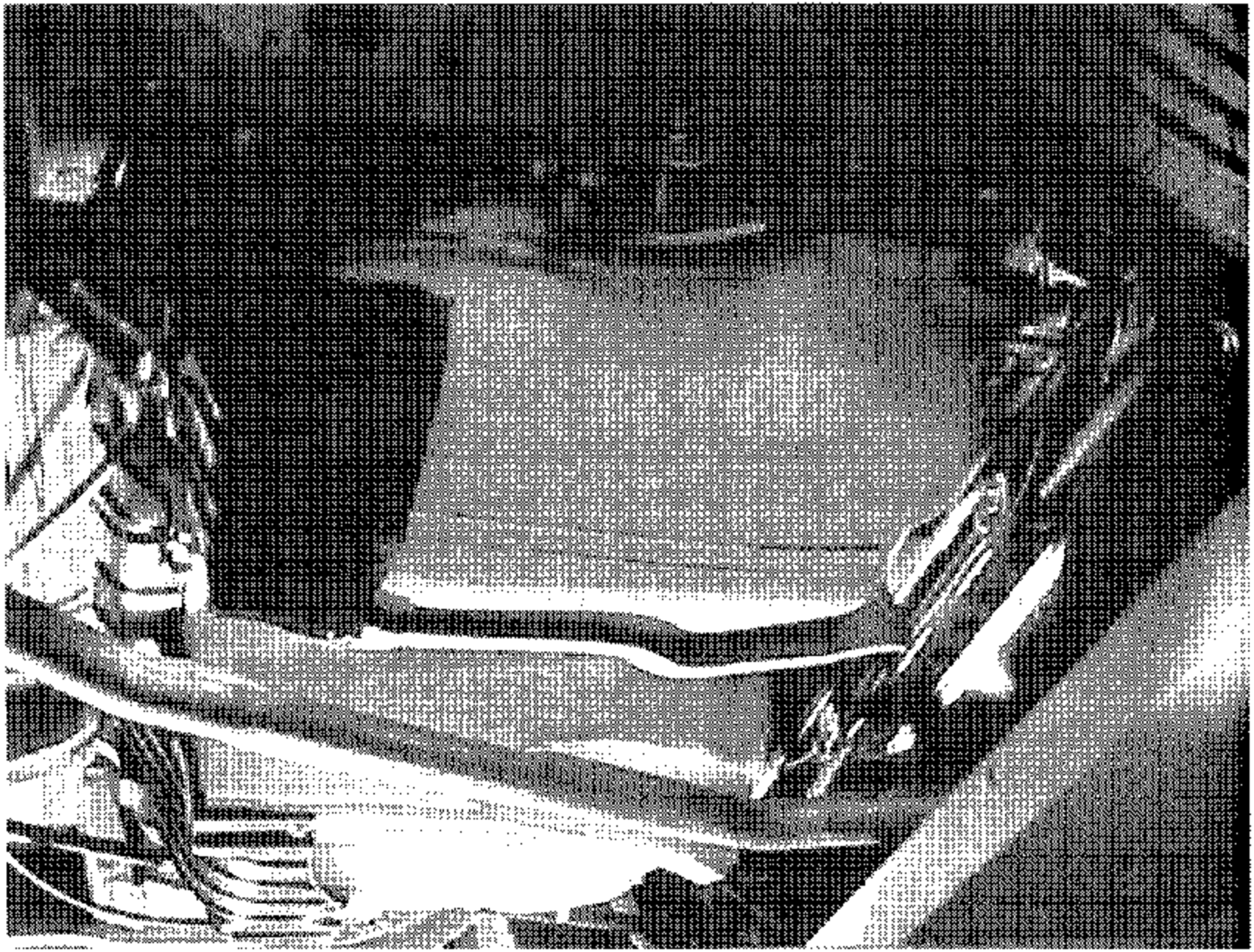

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FIGURE 5.31
UNDERBODY VIEW OF FUEL TANK LEFT
VIEW POST TEST

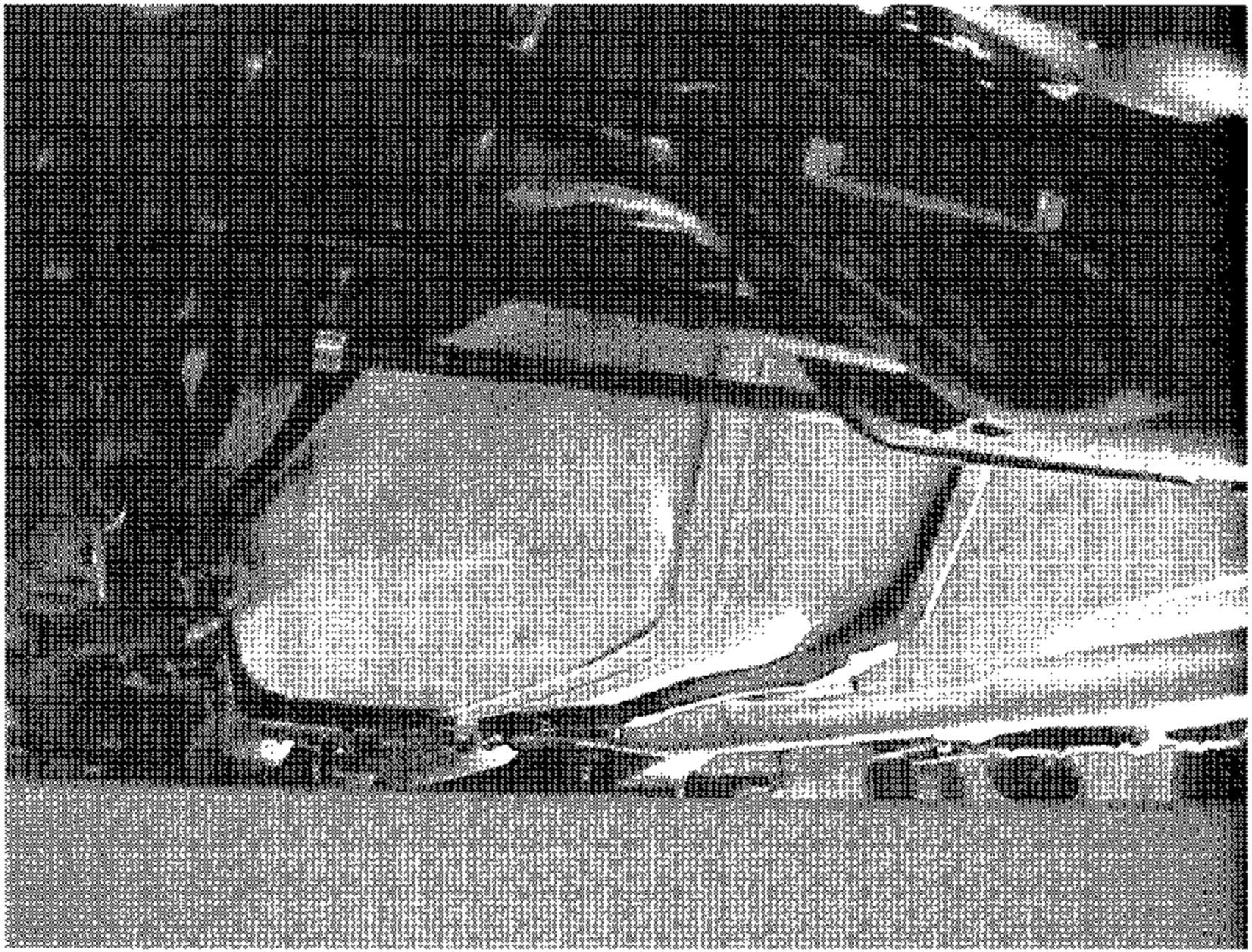

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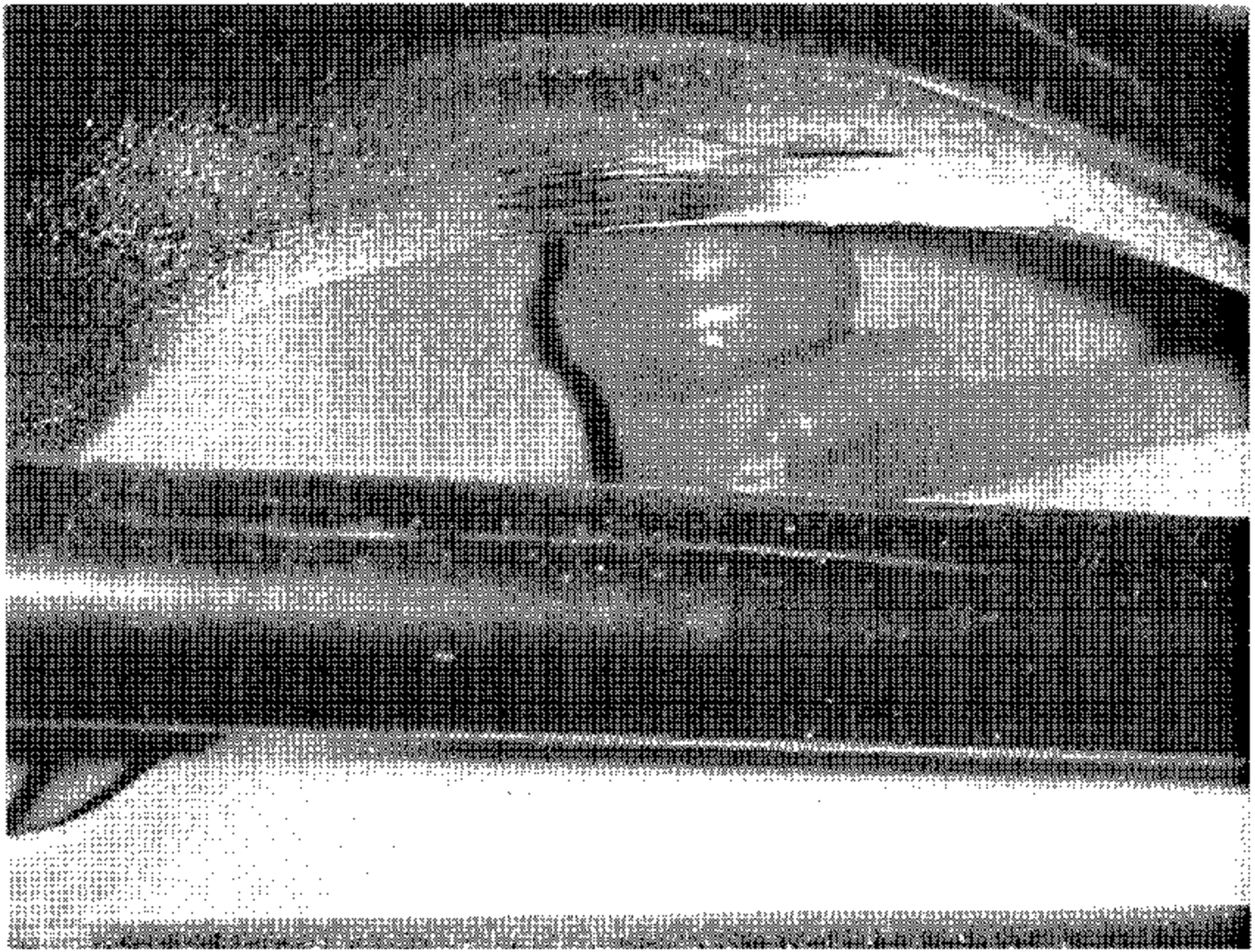
FIGURE 5.32
UNDERBODY VIEW OF FUEL TANK
REAR VIEW POST TEST



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FMVSS NO. 301

FIGURE 5.33
UNDERBODY VIEW OF FUEL FILL HOSE
AT TANK POST TEST

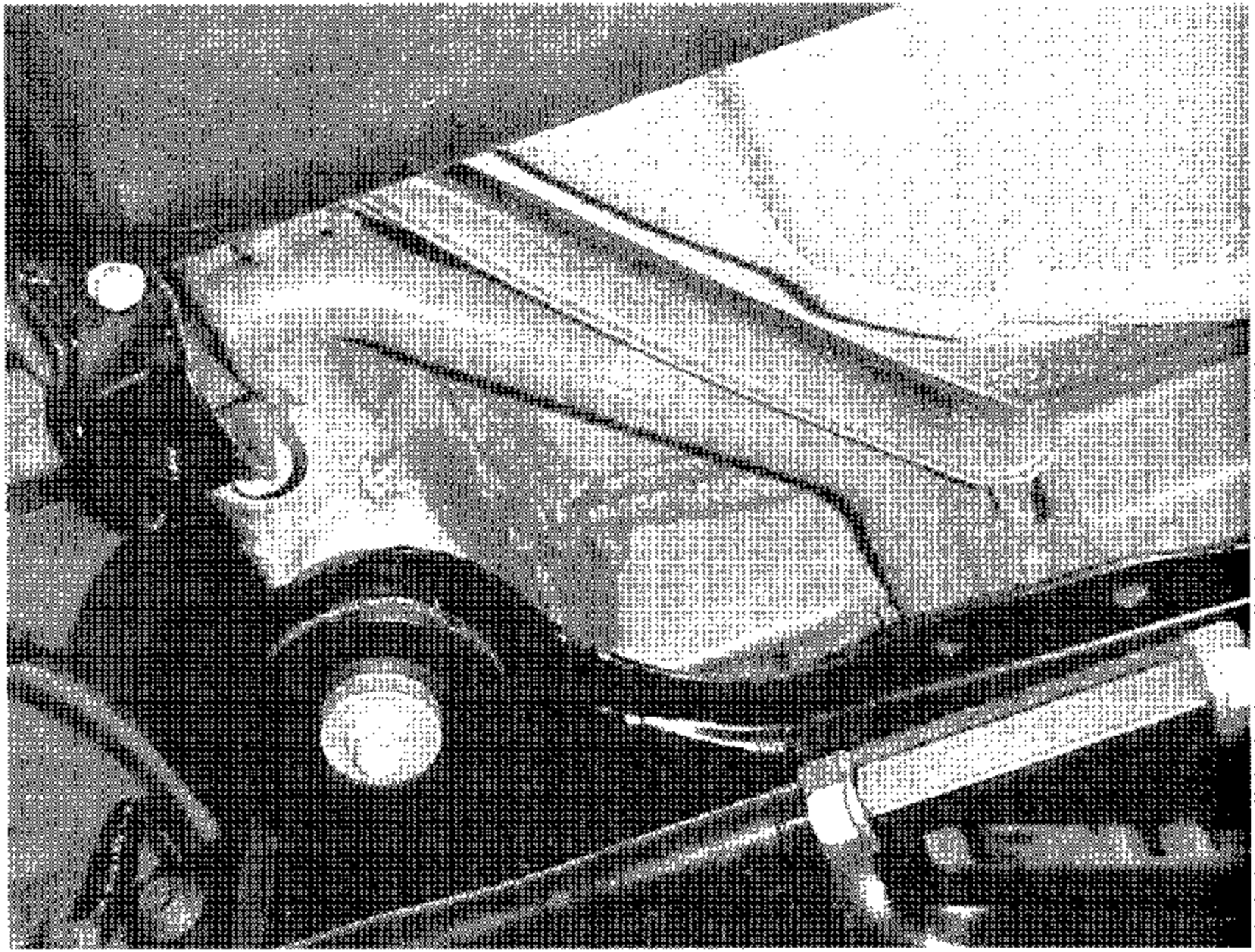

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FIGURE 5.34
UNDERBODY VIEW OF FUEL FILL HOSE
IN CENTER POST TEST

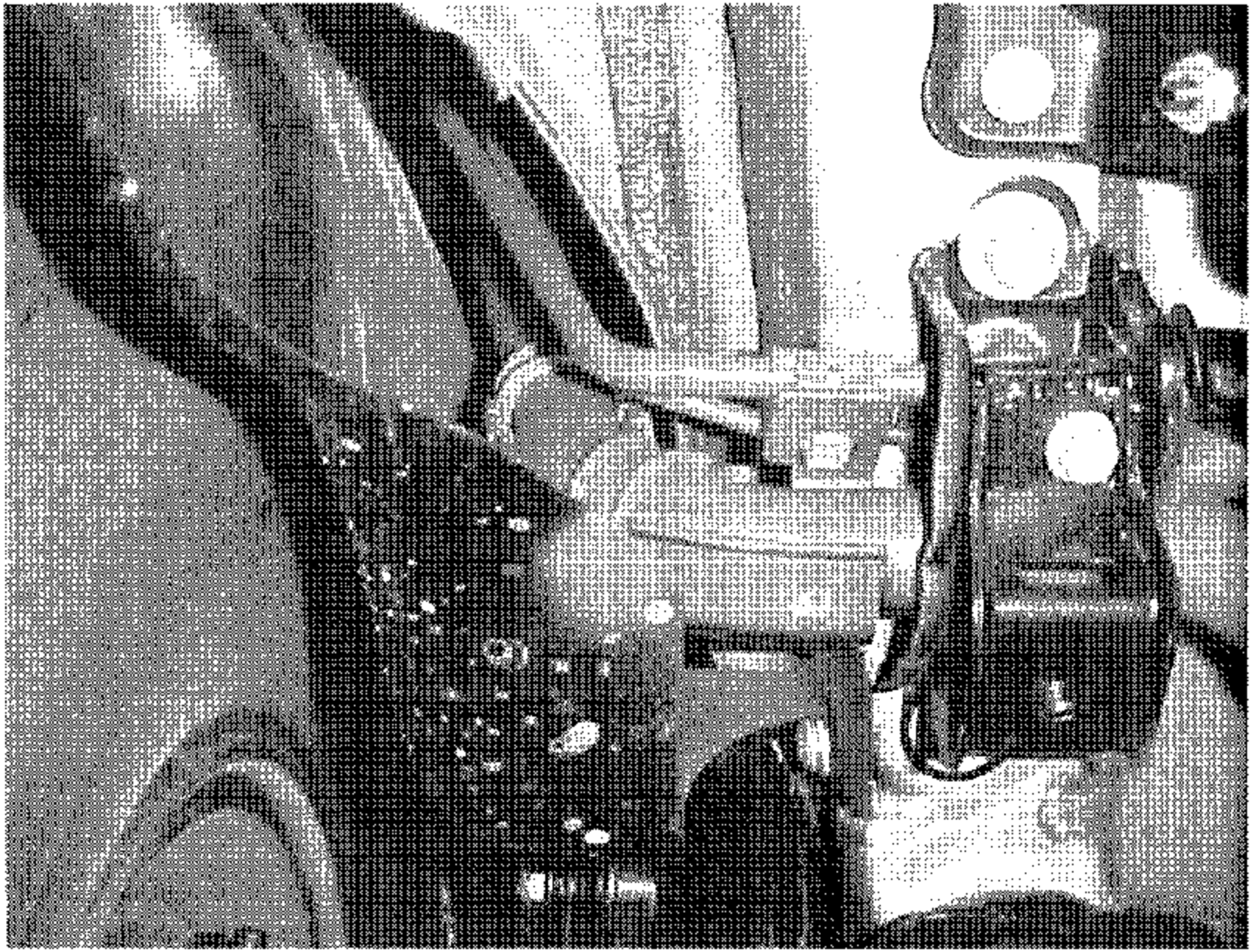

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FIGURE 5.35
UNDERBODY VIEW OF FUEL FILL HOSE AT FILL POST TEST

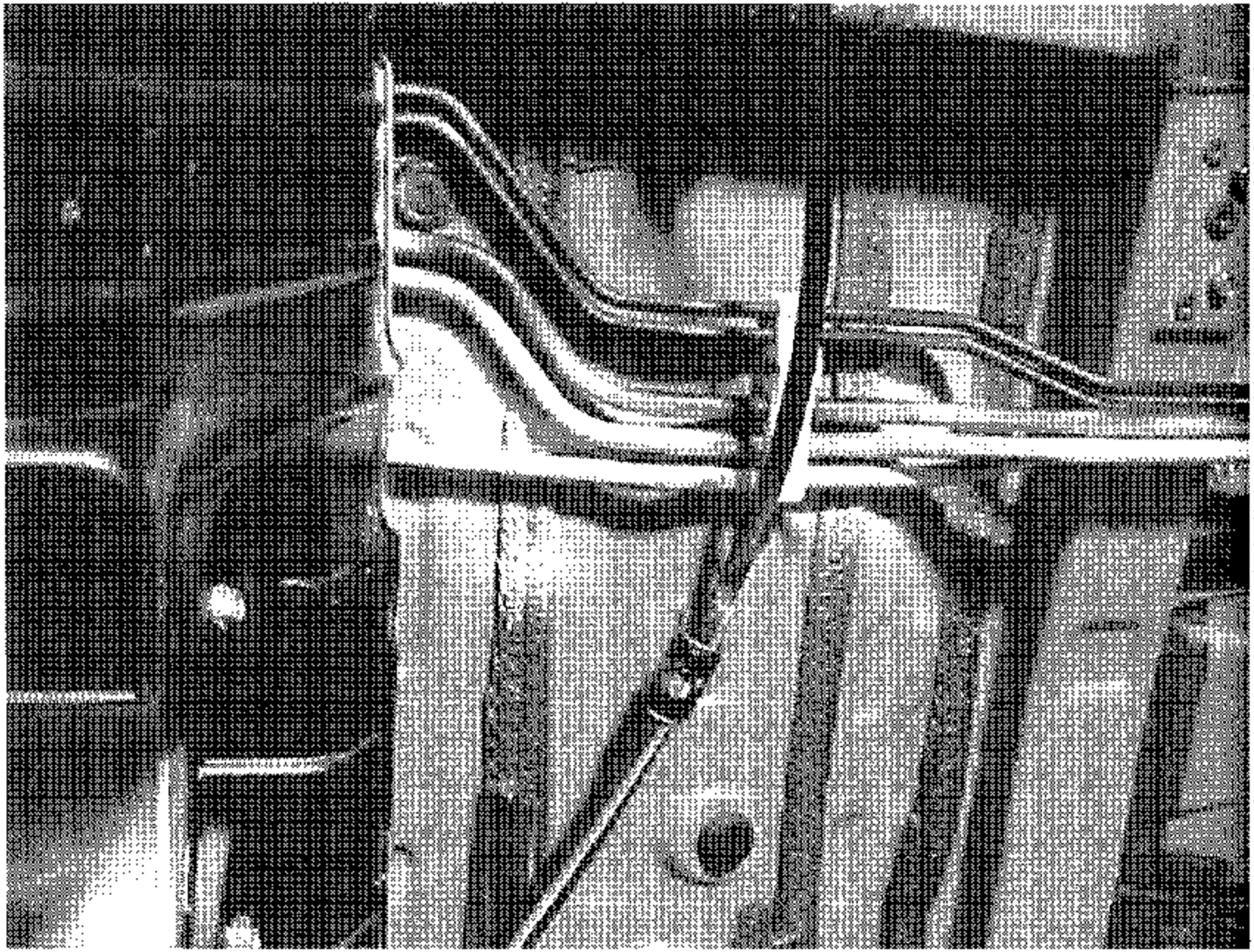

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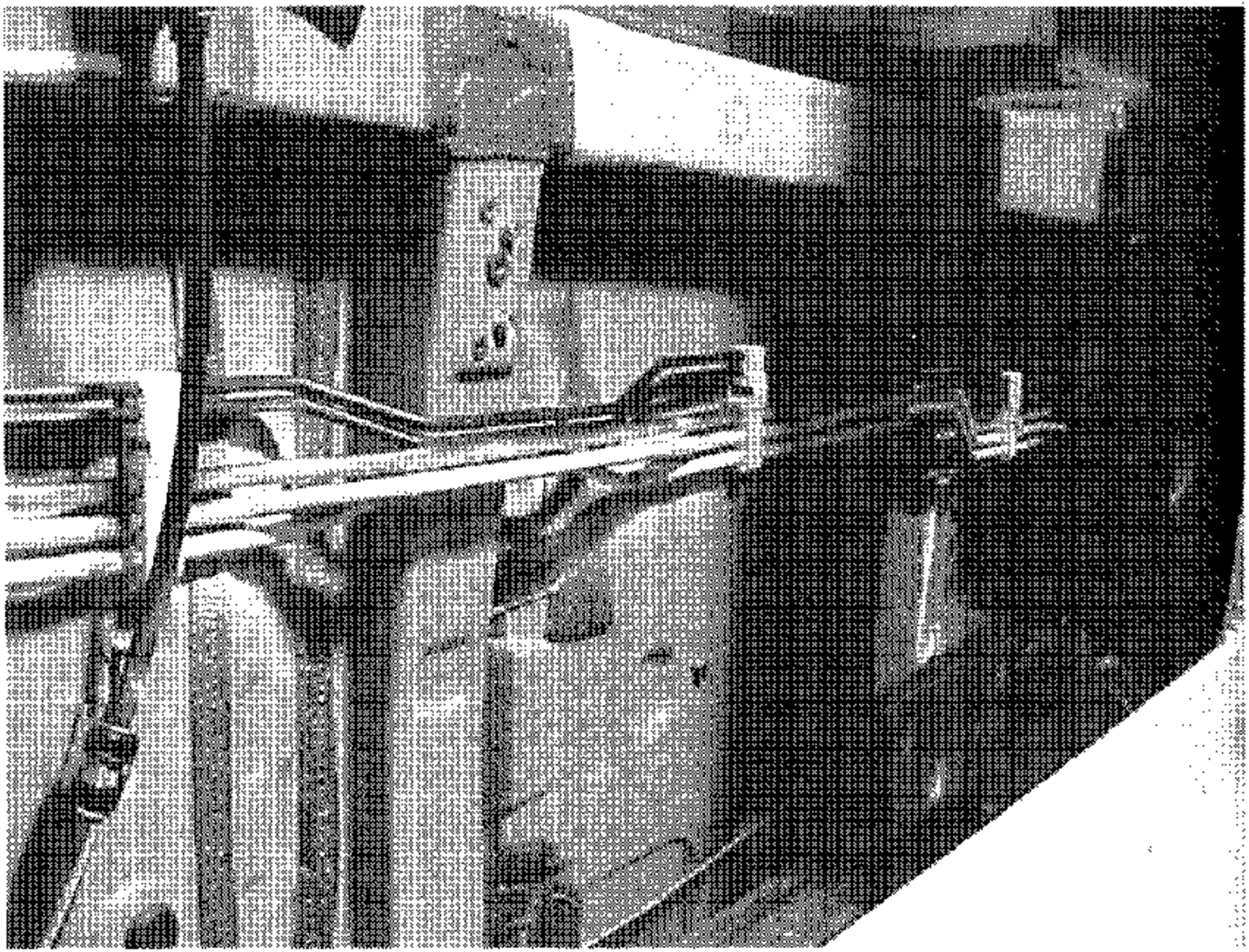
FIGURE 5.36
UNDERBODY OF FUEL LINES AT TANK
POST TEST



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NHTSA NO. C35103
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FIGURE 5.37
UNDERBODY VIEW OF FUEL LINES IN
CENTER POST TEST

FIGURE 5.38
UNDERBODY VIEW OF FUEL LINES ON
ENGINE POST TEST

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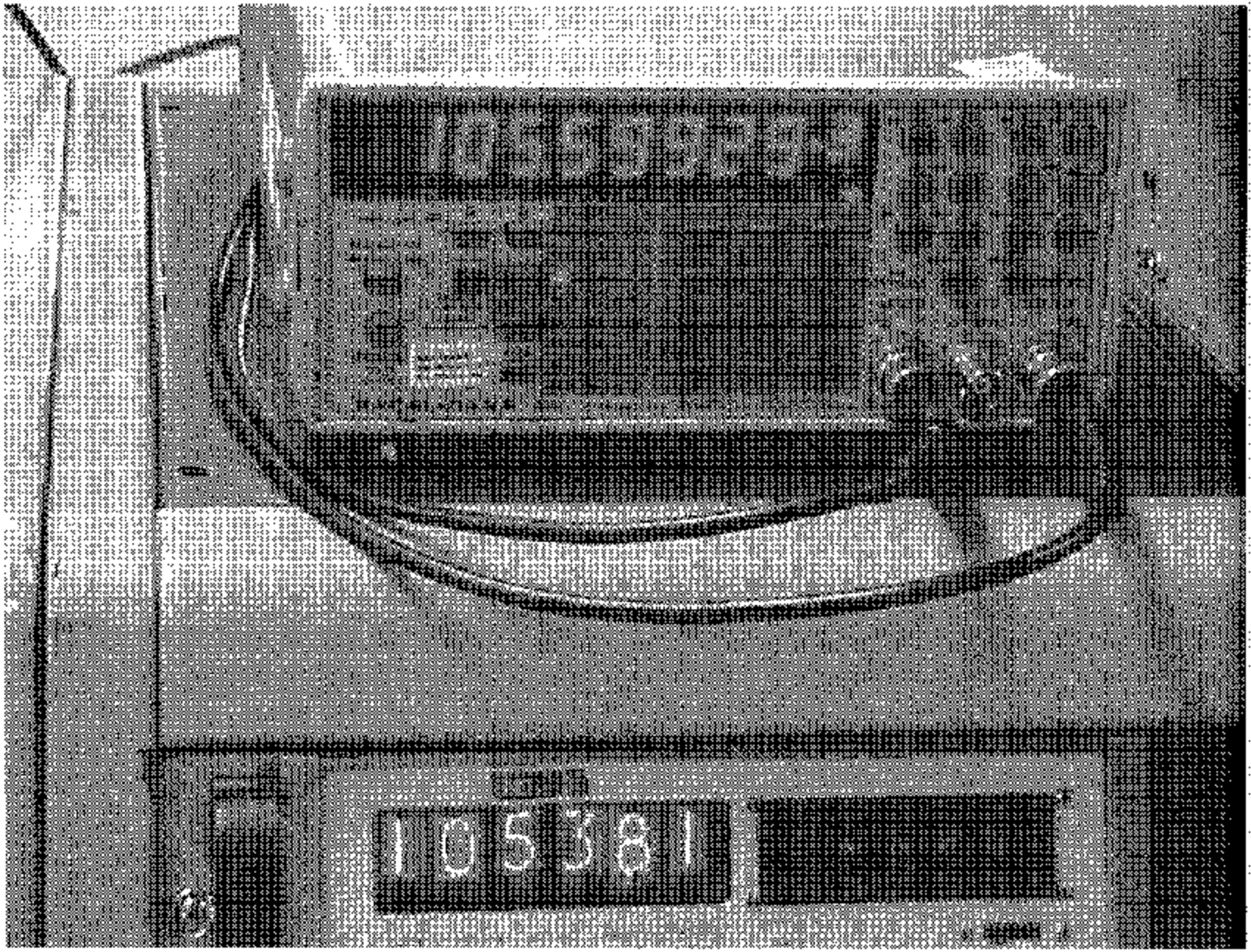
PASSENGER SIDE



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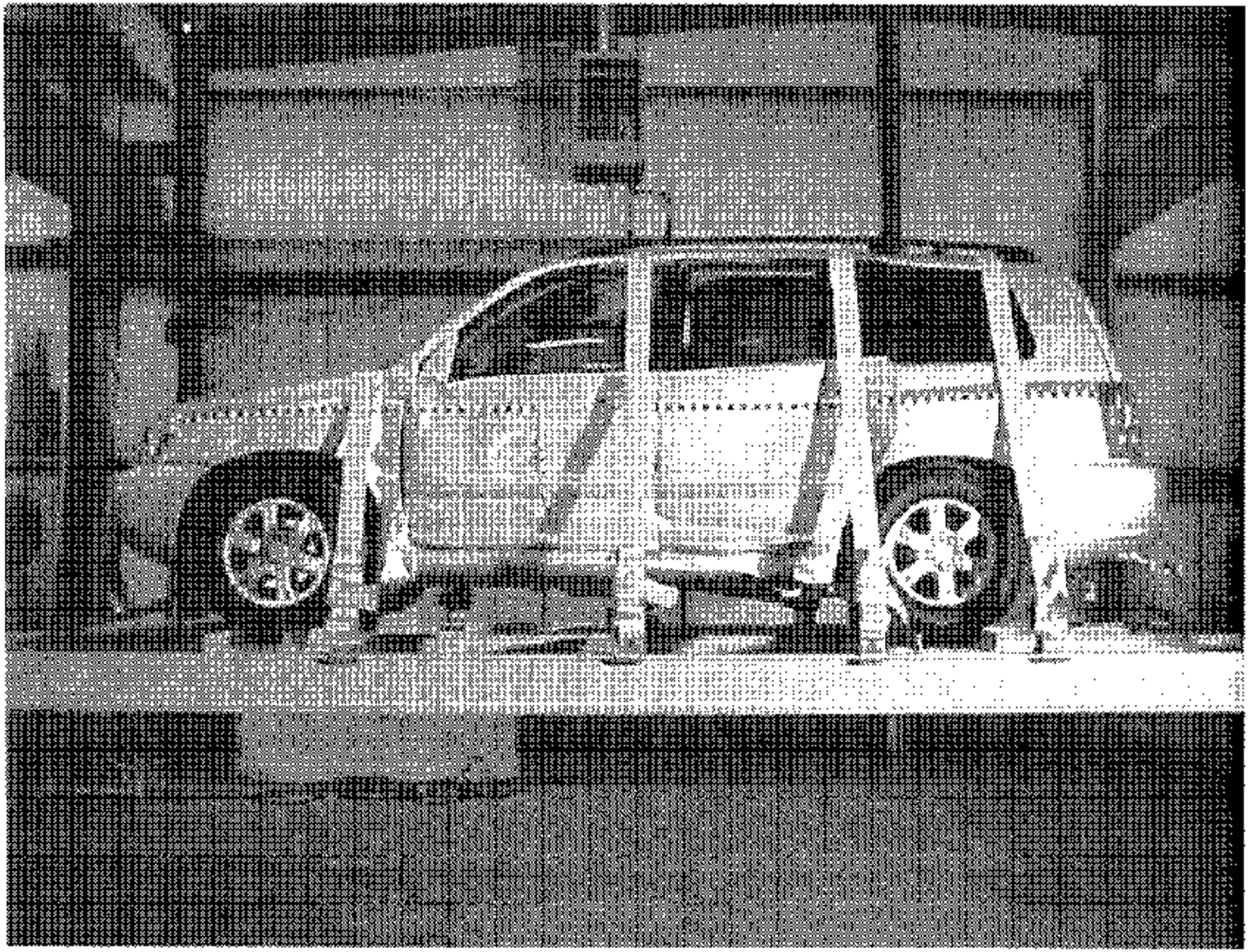
NHTSA NO. C35103
FMVSS NO. 301L

FIGURE 5.39
SPEED COUNTERS POST TEST



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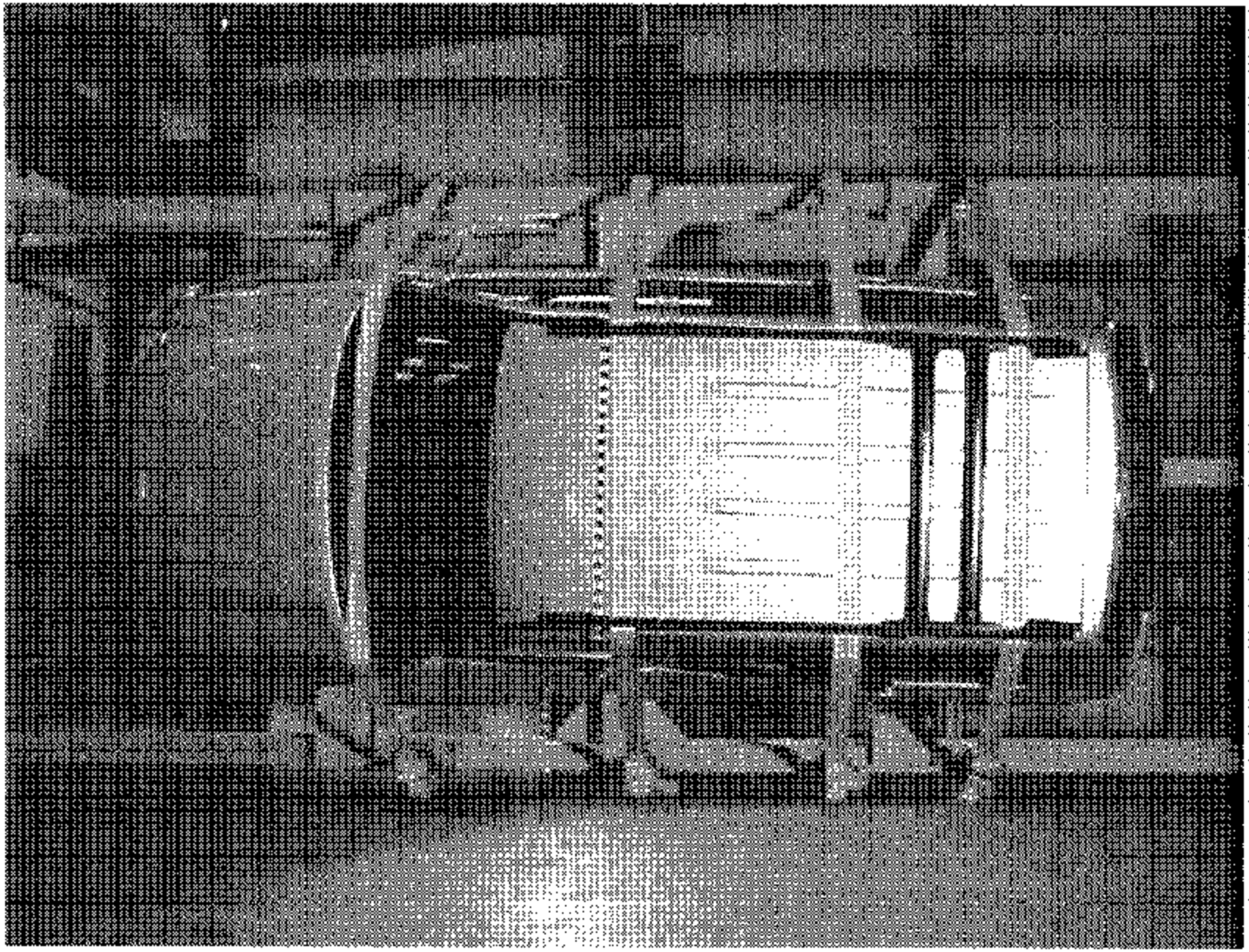
NHTSA NO. C35103
FMVSS NO. 301L

FIGURE 5.40
VEHICLE IN ROLLOVER FIXTURE AT 0°



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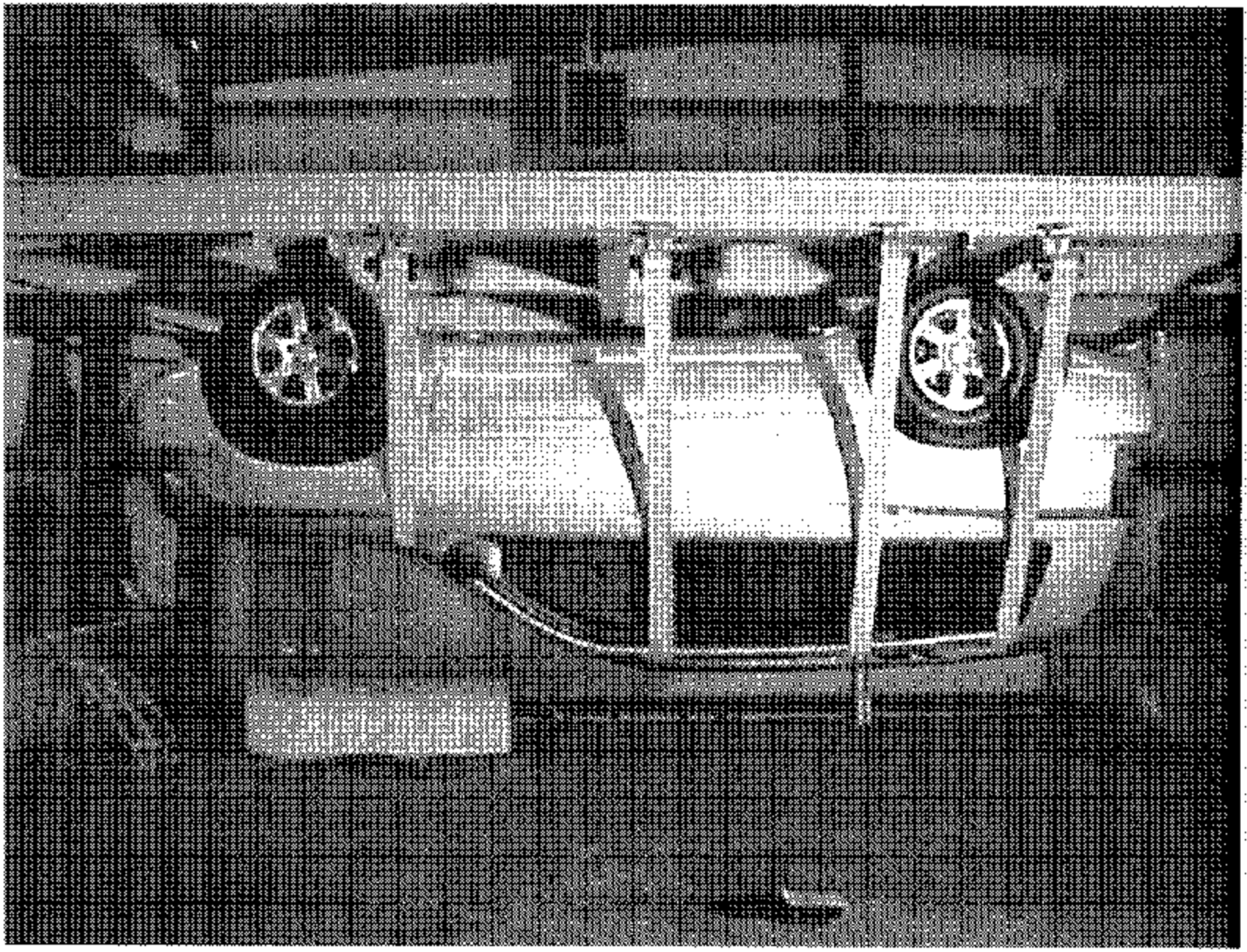
FMVSS NO. 301L

FIGURE 5.41
VEHICLE IN ROLLOVER FIXTURE AT 90°



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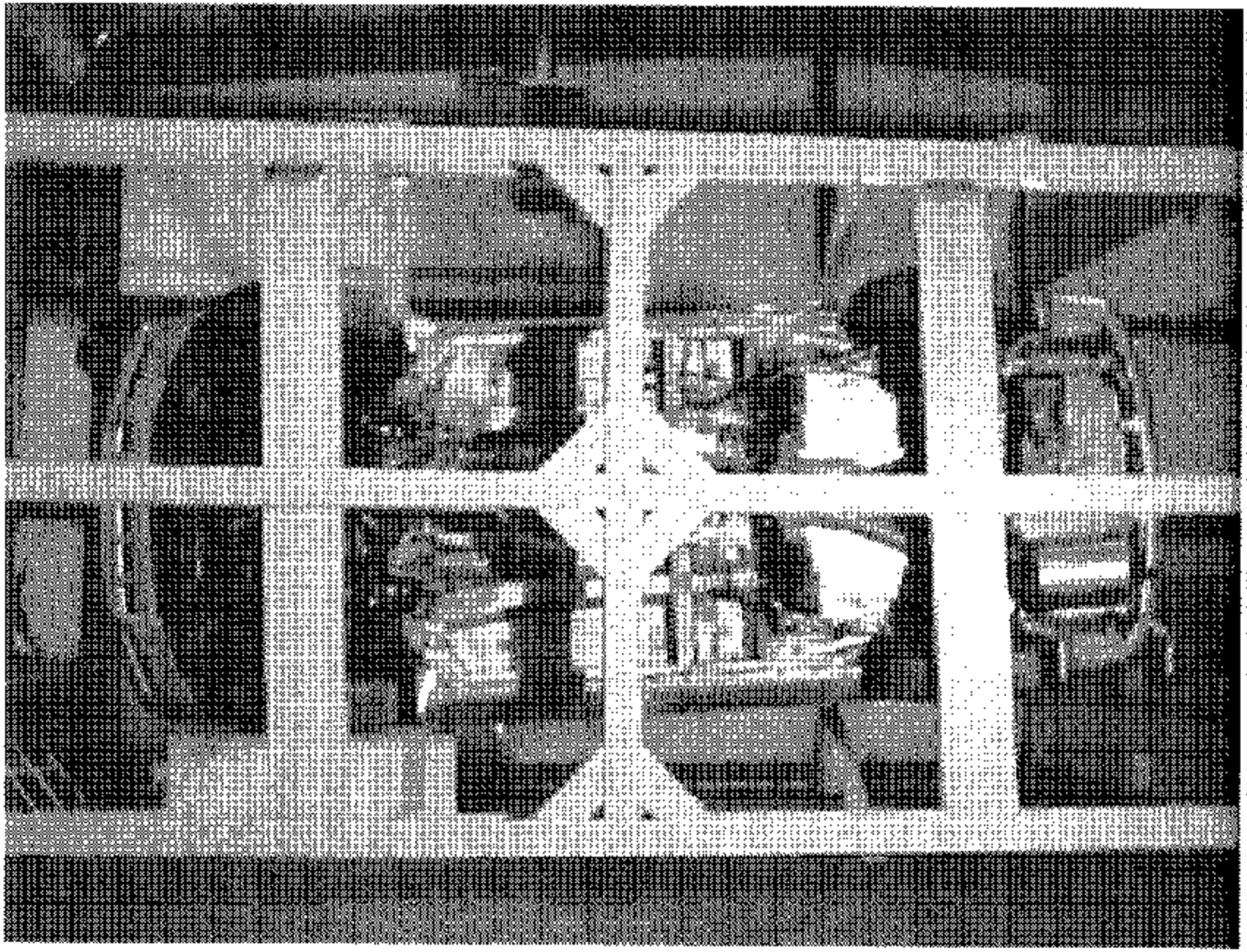
FMVSS NO. 301L

FIGURE 5.42
VEHICLE IN ROLLOVER FIXTURE AT 180°



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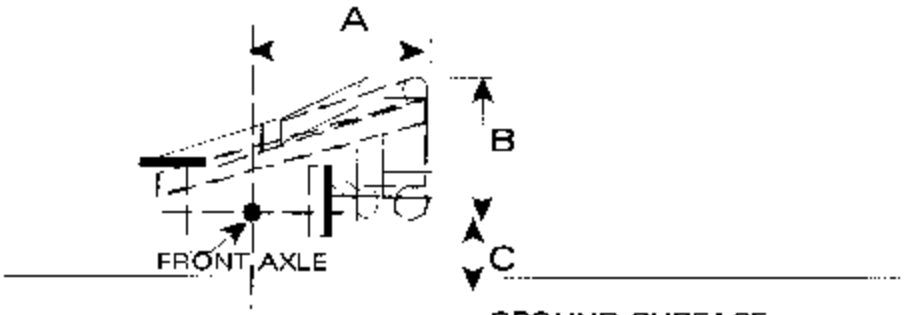
FMVSS NO. 301L

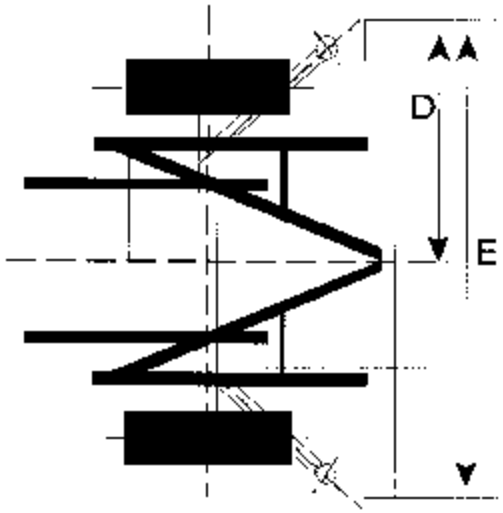
FIGURE 5.43
VEHICLE IN ROLLOVER FIXTURE AT 270°

SECTION 6

BARRIER INFORMATION



SIDE VIEW



TOP VIEW

DIMENSIONS SHOWN IN TABLE ON NEXT PAGE

NOTES:
1. Face Plate 0.50 in. (19mm) thick cold rolled steell
2. All Inner Reinforcements 4.0 x 2.0 x 0.19 in. (102 x 51 x 5mm) Steel Tubing
3. Impact Surface above shown without .75 x 48 x 96 in. Plywood Face attached

LETTER	INCHES	MILLIMETERS
A	20.5*	521*
B	60.0	1524
C	5.0	127
D	39.0	991
E	78.0	198

TEST SET-UP OF COMMON CARRIAGE WITH 60" x 78" FLAT FACE IMPACT SURFACE INSTALLED:

LEFT FRONT WEIGHT	1081
RIGHT FRONT WEIGHT	1079
LEFT REAR WEIGHT	882
RIGHT REAR WEIGHT	873
TOTAL WEIGHT	3915

* EXCLUDING 3/4" PLYWOOD FACE

DIMENSIONS FOR GTL 60" x 78" FLAT FACE IMPACT SURFACE